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VARIATIONS ON A THEME
BY JOHN HERSCHEL

MADELINE GROENEWALD

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A minor dissertation submitted in partial fulfilment of the requirements for the
award of the degree of Master of Fine Art.

Michaelis School of Fine Art
Faculty of the Humanities
University of Cape Town
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This work has not been previously submitted in whole, or in part, for the award of
any degree. It is my own work. Each significant contribution to, and quotation in,
this dissertation from the work or works of other people has been attributed and has
been cited and referenced.

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Signature: Signature Removed Date: 2014/04/18

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INTRODUCTION

TRAVELLING BACK IN TIME



26 February 2012, Cape Town

It is a sunny afternoon. I am sitting in my studio and looking up a star on Stellarium, an astronomy computer programme. I doubt I will find this star in the sky tonight since the light pollution from the city obliterates the view of most stars, and instead I imagine myself in this virtual nightscape. The star is called Beta Sculpture and it is situated in the constellation “The Sculptor’s Studio”. It was first chartered by Nicolas de la Caille, who also contributed significantly to the terrestrial cartography of Cape Town¹. But this star holds another history. Beta Sculpture is 178 light years away, meaning that the light that reaches Earth is an image of the star as it appeared 178 years ago. If I were to invert my gaze and look back from this star to my own position, I would see an image of Cape Town as it was in 1834.

16 January 1834, Cape Town

The “Mountstuart Elphinstone” lies anchored in the bay. John Herschel, a British astronomer who has travelled here with his family, looks out onto the city. Cape Town is enclosed between a mountain and the southern ocean and populated by 19 000 people. The South Easter is sweeping up red dust from the wide, unpaved, oak-lined roads, which are woven in a grid between houses of neoclassical, Rococo and Dutch designs. A canal runs down the length of the principle street, Heerengracht, and into the nearby sea. Two roads run out of town: one to the west and one to the east. Here the landscape is mostly characterised by open “veld” with intermittent farms and country estates².

¹ Laney, 2005.

² This account is based on factual information from Brian Warner’s publication *Cape Landscapes: Sir John Herschel’s sketches, 1834 to 1838*, 2006 and *Flora Herscheliana: Sir John and Lady Herschel at the Cape 1834 to 1838*, 1996.

Herschel resided in Cape Town until 1838. He set up a telescope in the orchard of their estate, Feldhausen, in Wynberg, and worked towards completing a systematic survey of the southern hemisphere for stars, nebulae and other celestial objects (Warner, 1996:55 & Buttmann, 1974:104). Herschel's observations in the Cape were not only focused on astronomy. His scientific contributions included work in the fields of geology, meteorology and botany and this scope of diversity extended beyond the disciplines of science since he also pursued his interests in poetry, music and visual art (Buttmann, 1974:112 & Schaaf, 1989:10). Herschel played the flute and was also an avid draughtsman, evident in the extensive collection of sketches that he made of Cape botanicals and landscapes (Schaaf, 1989:10). In addition to these sketches, his diary entries from his stay in Cape Town, published in *Herschel at the Cape: diaries and correspondence of Sir John Herschel, 1834 to 1838* provide another affirmation of his variety of skills, since poetic descriptions and multi-sensory observations can be found amongst scientific and analytical inquiries. For example, in his diary entry March 1836 he commented on a nightjar's song and included a music staff with an accurate notation of the bird's melody. In a letter to William Henry Harvey in 1837 Herschel wrote about the scents of Cape flowers, applying perceptive metaphors for each flower species, such as cinnamon, pepper and ginger (Warner, 2011:34-35). He often created links between his observations from these different fields, such as applying his study of botany to that of photography by using Cape flower juices for photographic colour filters (Schaaf, 1992:98).

The title of my MFA project references John Herschel as well as the *Theme and Variation* form in music in which a single musical theme, often written by a different composer, is followed by a series of developments of this theme through the employment of a range of compositional techniques (Lindsay, n.d.). The body of work that I created is structured according to this musical form. I used Herschel's representations from and of the Cape as the basic theme which I then developed through a series of variations, employing media and methods across disciplines, time periods and sense modalities. By way of this process of mediation, the resulting art works become parallel records of my own specific experience of Cape Town.



JOHN HERSCHEL
Camera lucida sketches of Lion's Head and Table Mountain, Cape Town.

With this methodology the work aims to focus on the creation of relations and translations through time and space: between myself and my environment and John Herschel's explorations in Cape Town from the 19th century.

A timeline, or time visualised as a line, has been a principle metaphor used throughout historical chronology (Roseberg & Grafton, 2010:138). However, the experience of looking up at the stars can represent an alternative view of time, imagined less as a linear sequence, but rather as scattered points of history. This idea of time is well captured by William Kentridge's description of space as "archives of images". This connotation comes from a discussion of the work *The Refusal of Time* created in collaboration with Peter Galison for the international exhibition, *Documenta (13)*. The work takes the form of an installation with elements of film, music, sculpture and performance, all centred around an investigation of the concept of time (Koerner, 2012). My project has been influenced by art works which, like *The Refusal of Time*, work on the threshold between art and science and in the subsequent chapters I will refer to similar works in relation to my topics of discussion and to the theme of Herschel in the Cape.

During his stay in Cape Town, Herschel mapped more than 2 000 new double stars and over 1 500 new nebulae (Warner, 2006:67)³. These were hand-drawn directly from the eyepiece of the telescope and this was the last survey conducted in this method before celestial photography became the dominant practice (Warner, 2011:30). It was published in *Results of Astronomical Observations Made at the Cape of Good Hope* and I found this document of "archives of images" within another archive, that is, the University of Cape Town's Rare Book Collection. The drawings are reproduced as lithographs in which collections of fine, grey dots form the various shapes of the nebulae. The images are striking in their delicacy and meticulous detail. Herschel's intention was for this accuracy to allow the drawings to be compared with subsequent images from future generations. This is evident in the case of the nebula Eta Carinae as contemporary photographs show that it has changed since Herschel drew it (Warner, 1992a:38). These celestial drawings are markers of the concept of

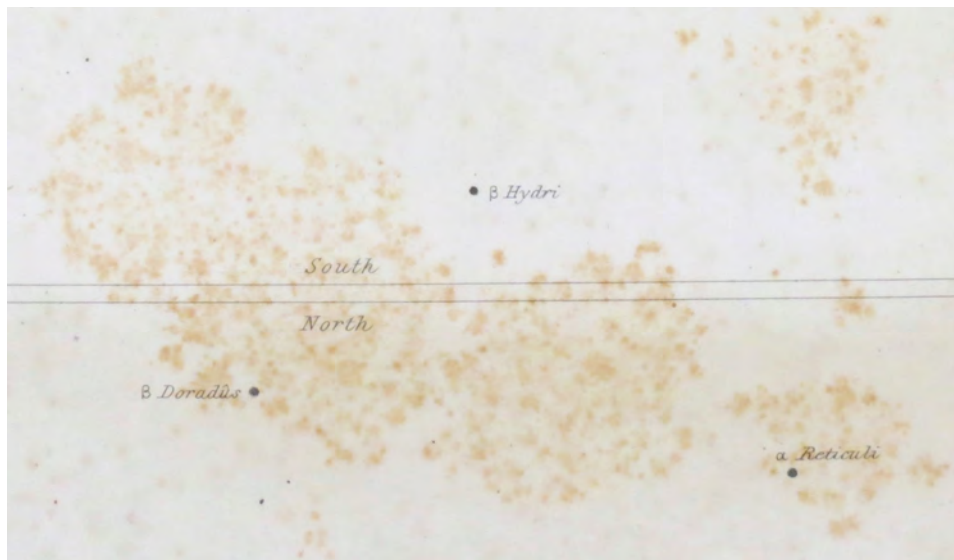
3 The word "Nebula" comes from the Latin word which literally means "cloud". In astronomy it is an interstellar cloud made up of gas and dust that collect together. It is often the "birth place" of stars as well as their end-points (Villanueva, 2010).

time, but they also hold unintentional records of the passage of time and it is this aspect that first drew my attention to this publication: foxing patterns had accumulated on the printed drawings due to the age of the publication itself. These marks blend with the visual representations to the point where it is sometimes difficult to discern which marks are drawn and which are stains. As a result they become parallel nebulae and stars, imagined spaces that become records of time of a different timescale to the far-off light years of their counterpart drawings.

The concept of change over time was of particular significance in Herschel's scientific work. Unlike his contemporaries, Herschel viewed nature as dynamic rather than static; a view that came largely from his investigation of Cape flora. However, not only was the passage of time his subject of study, it also informed his methodology. Herschel's scientific examinations were process driven. He followed the Baconian philosophy which asserts that all knowledge should come from vigorous observation and experimentation (Warner, 1996:17). Herschel's frequent use of the camera lucida⁴ attests to this: the process of drawing as a physical, durational action gave him an opportunity to analyse the scene he was recording through a viewing experience that is built up in layers over time⁵.

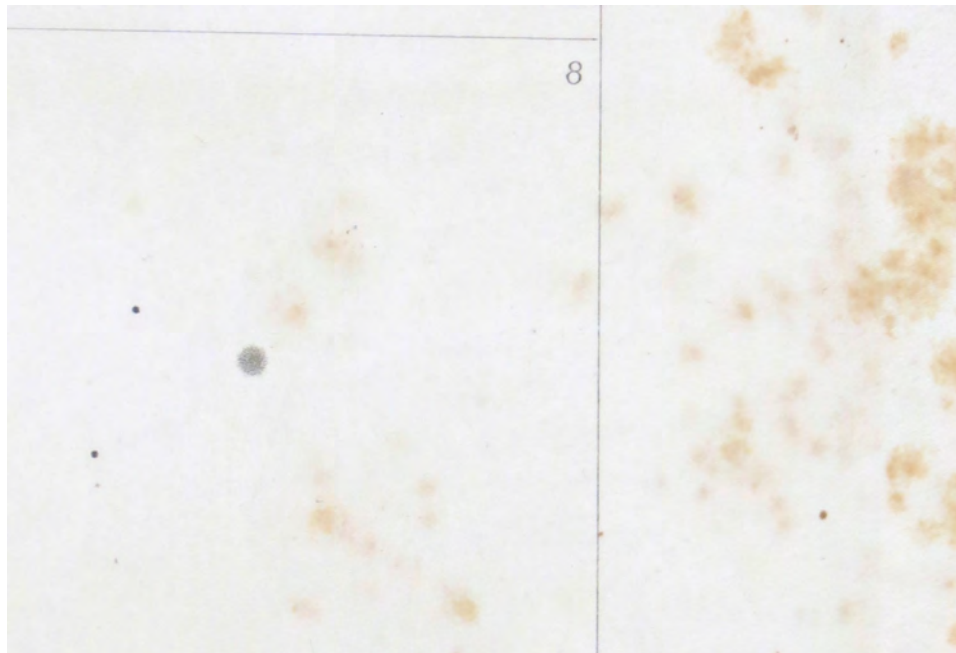
4 The camera lucida is a drawing instrument that consists of a small glass prism mounted on a rod which can be attached to the drawing surface. When looking down into the prism at the exact angle, the scene in front of the prism will appear as a reflection to the eye. When part of the eye is looking past the prism, both the paper and the scene will appear in view and the illusion can be traced in drawing (Schaaf, 1989:12).

5 Schaaf suggests that his preference for the camera lucida and its process might have been part of the reason behind the fact that, although Herschel was well established to invent photography, Henry Talbot beat him to it in 1839. The camera lucida provided a better method of representation for Herschel than photography would have, since the instant action of taking a photograph would not have provided the same opportunity of engaging with the represented space (Schaaf, 1989:32).



JOHN HERSCHEL

Images from *Results of Astronomical Observations Made at the Cape of Good Hope*, 1847



Different embodiments of time can be discerned from the abovementioned references. On the one hand, time is seen through the lens of the telescope or the camera lucida; stars as archives and flowers as records of evolutionary change. On the other hand, time is seen from the other side of these lenses, namely the context and method of mapping from which the representations originate; foxing patterns as traces drawn by the process of time and botanical drawings as records of the process of viewing. It is these variations in time that interest me in terms of my own relationship with my surroundings: the passage of time within the natural environment of Cape Town but also time in relation to my own presence and engagements within my space. In response to this my work focuses on process. My methodology is meticulous and governed by the space that I work in (which is often outdoors) and calculations that mimic scientific methods of representing and mapping the environment.

Cartographic scholar John Pickles argues that the map is too often regarded as the medium in itself while its immediate context is occluded; a context like the report or book in which the map is published, the chapter in which it appears and its accompanying caption. He notes: “The map is a text, like any other in this regard, whose meaning and impact may go far beyond the limits of technique, the author’s intention, and the mere transmittal of information” (2004:43-44). This focus on context is well illustrated by an occurrence of the astronomer who mapped the *Sculptor’s Studio* constellation. In 1753 Nicolas de la Caille conducted measurements in Cape Town which appeared to show that the southern hemisphere of the earth had a different shape to the northern hemisphere – the earth was slightly pear-shaped. It was later discovered that the magnetism of Table Mountain was affecting the measuring instruments and that this was the cause for the strange results (Hettlage, 2012). Three years later De la Caille mapped the constellation known as *Mensa*, a depiction of Table Mountain (Ridpath, n.d.)⁶. By doing this he unknowingly acknowledged the influence of his spatial context on his scientific representation thereof: he was literally superimposing and tracing his terrestrial surroundings (which also infiltrated his method of mapping) over the celestial space that he was representing. In the light of

6 De la Caille originally gave it the name *Montagne de la Table* and this was Latinised to *Mons Mensae* in 1763. In 1844 John Herschel suggested shortening it to *Mensa*, which is the current official name for this constellation (Ridpath, n.d.).

my methodology of translation, the focus of my project is more on this “pear-shaped” map than on the “correct” scientific calculation; on the foxing stains in Herschel’s publication more than on the intentional drawings. It is through these distortions in scientific representation that the significance of context, method and subjectivity become apparent.

Another example of the presence of subjectivity in scientific representation is the impact of political and social contexts on map-making. Within the history of cartography maps have often been misconceived as being “neutral” or “objective” while they were, in fact, socially constructed to make specific statements about the spaces that they represent (Wood, 1992:2). Although my project considers the role of subjectivity within scientific representation, it does not focus on political intention but instead on the process of translation inherent between the represented space and the unintentional elements that enter the representation. The project furthermore concerns the mapping of the environment through my personal, particular view of my space in relation to Herschel’s particular view of this same space from the 19th century.

Herschel kept his distance from politics, both from the British empire [his journey to the Cape was independently funded] and from the Government in the Cape in the 19th century, which found itself in a climate of Anglicisation, debates around rights for slaves and indigenous residents and the establishment of freedom of speech [Herschel escaped to Paarlberg for a day, in order to avoid attending a dinner with the Governor, Benjamin D’Urban]. Although not impacting his scientific work directly, Elizabeth Green Musselman argues that the metaphors he used for his work were a reflection of the influence that the politics in the Cape had on his scientific work. She mentions that before visiting the Cape he compared astronomy to a “hunt”, but the reality of colonial violence in the Cape caused a shift towards the use of the word “harvest”, a significantly less aggressive agricultural metaphor (Dubow, 2006:42-43).

Similar to this indirect influence of social concerns in Herschel’s work, I acknowledge my own connection to socio-political concerns. In *The Power of Maps* Denis Wood comments on the influence of history on his personal view of the

environment in “the way my growth and development was (and continues to be) shaped by the ceaselessly changing social and physical environments that I at the same time collaborate on bringing into being” (1992:30). My view of my space as shaped by social history has surfaced to a degree in my active engagement with the spaces in which I produce work. In one instance I made a drawing based on the shadow cast by an English Oak tree that grows close to the terrain where Herschel’s telescope stood while he stayed in Cape Town. The work considers the possibility that this tree could be old enough (at least 175 years old) to have been there when Herschel resided in this area, a possibility which has been confirmed by Professor Edmund February of the University of Cape Town’s Botany Department (February, personal communication 2012, January 24). This space that once held an orchard and a telescope is now the grounds of the Grove Primary School. I produced this work under the oak tree on a hot summer day and I could hear a lesson being taught through an open classroom door. It was a lesson in Afrikaans second language and students were repeating words pronounced by the teacher. This space has significance on two levels: although the work is based on the possible history of this specific tree, I realised that it also belongs to a larger socio-political history and a history that I am part of due to my Dutch heritage. The English Oak tree was introduced to the Cape by Dutch commander Jan van Riebeeck in 1656 due to a demand for wood in the newly established Cape colony. Since then this tree has become established in the physical, social and cultural environment of the Western Cape (Kemp, 2002:75). The second significance lies in the space around this tree. Herschel made an important contribution to the school system in the Cape with the result of it becoming independent from the churches, orientated towards general and scientific knowledge and without the previous evident focus on Anglicisation. On a personal level, my mother tongue is Afrikaans and this was also the language that I was educated in throughout secondary schooling. In contrast, government schools were strictly conducted in English in the 1830s due to Anglicisation (Dubow, 2006:43). The production of this work was intended to be governed by elements of the tree.

However, the work was also unintentionally influenced by the time table and the activities at this school⁷, which became a reflection of the influence of this social history on my identity and my way of engaging with the environment of Cape Town.

I have attempted to lay the foundations of my “theme” for this project in terms of my context in time and space as related to that of a British astronomer who explored the same space in the 19th century. Brian Warner, who has written extensively on Herschel and whom I had the privilege to consult in preparation for this project, wrote the following remark on Herschel’s publication *Results of Astronomical Observations Made at the Cape of Good Hope*:

The *Results* remains unparalleled among the pioneering works of observational astronomy for the richness of its discoveries, made all the more remarkable for being the unaided effort of one individual. Much of its contents were not superseded until well into the 20th century (1992:63).

However, Herschel’s process of working suggests an opposite angle to the comprehensive immensity of his scientific achievements. Warner mentions that Herschel’s reason for conducting the extensive survey in the Cape was based on the method of including even seemingly minute or insignificant objects in his examination. Herschel explained this principle when he announced the proposed formation of the Astronomical Society in 1820:

Yet it is possible that some bodies, of a nature altogether new, and whose discovery may tend in future to disclose the most important secrets in the system of the universe, may be concealed under the appearance of very minute single stars no way distinguishable from others of a less interesting character, but by the test of careful and often repeated observations (quoted by Warner, 1992a:23).

While my work references Herschel and the significant legacy that he has left, my methodology of working with this reference similarly provides an alternative angle as it is based on subtle, often unnoticed and almost trivial subjects and actions: a foxing pattern next to a depicted nebula, a tree standing on a pavement, a small rock hidden next to the Platteklip Gorge trail on Table Mountain, a fleeting shadow.

⁷ The shadow of the tree happened to be near the gate of the school, on the side of the road where parents parked their cars to pick up their children after school. My drawing process was therefore governed by specific times of the school day.

CHAPTER I.

A STONE THROW AWAY

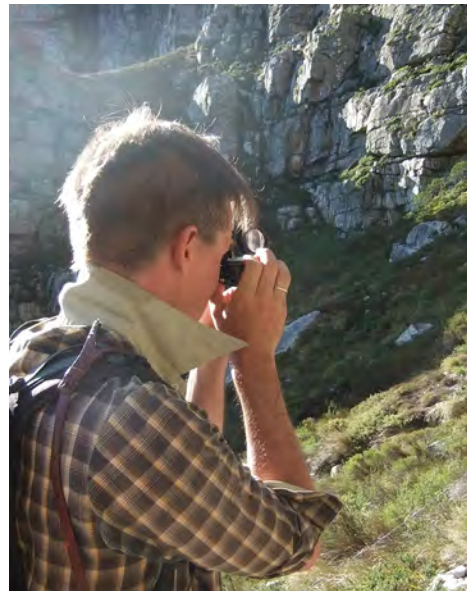
22 May 1837, Cape Town

John Herschel sits upon a rock at the summit of Table Mountain. With a camera lucida mounted on a drawing board he records the view from this perspective, framed by the Platteklip Gorge. At 6:00 this morning he set out to climb the mountain in the company of his wife, Margaret, and a guide. They had marvelled over the view from the mountain and were amused by the shapes of the sandstone rocks that were contorted by wind and rain into reminiscent shapes. Near the top they recovered the thermometer that Herschel hid under a stone at a previous hike in order to record the extreme temperatures on the mountain⁸.

17 February 2013, Cape Town

I am standing by a rock at the summit of Table Mountain. According to the last measurement, taken at 09:36, the temperature is 30 degrees Celsius and the humidity is 41%. The altitude is 1 070 metres above sea level. "Are you geographers? Is that a map?" a tourist asks me from the side of the hiking trail. I am holding a large paper against the wind and with soft pastel I carefully make a rubbing of the texture of the rock and place the paper safely back in the tube holder that I carried on my back up the mountain (mistaken for a telescope by another curious hiker). At 7:00 this morning, with a company of three friends, I set out to climb Table Mountain in an attempt to find the rock from which Herschel drew the Cape landscape in 1837. We followed the Platteklip Gorge trail and stopped every 12 minutes to take measurements of our orientation point as well as details of the environment. These included compass readings, temperature readings, the length and angle of a shadow and data from a cellphone application which recorded my distance and altitude and plotted my movement through GPS location. I found the (possible) rock by using Herschel's drawing as a finding sheet and orientating myself in the space until my view of the landscape matched the perspective of the drawing.

⁸ This account is based on factual information from Brian Warner's publication *Cape Landscapes: Sir John Herschel's sketches, 1834 to 1838*, 2006.

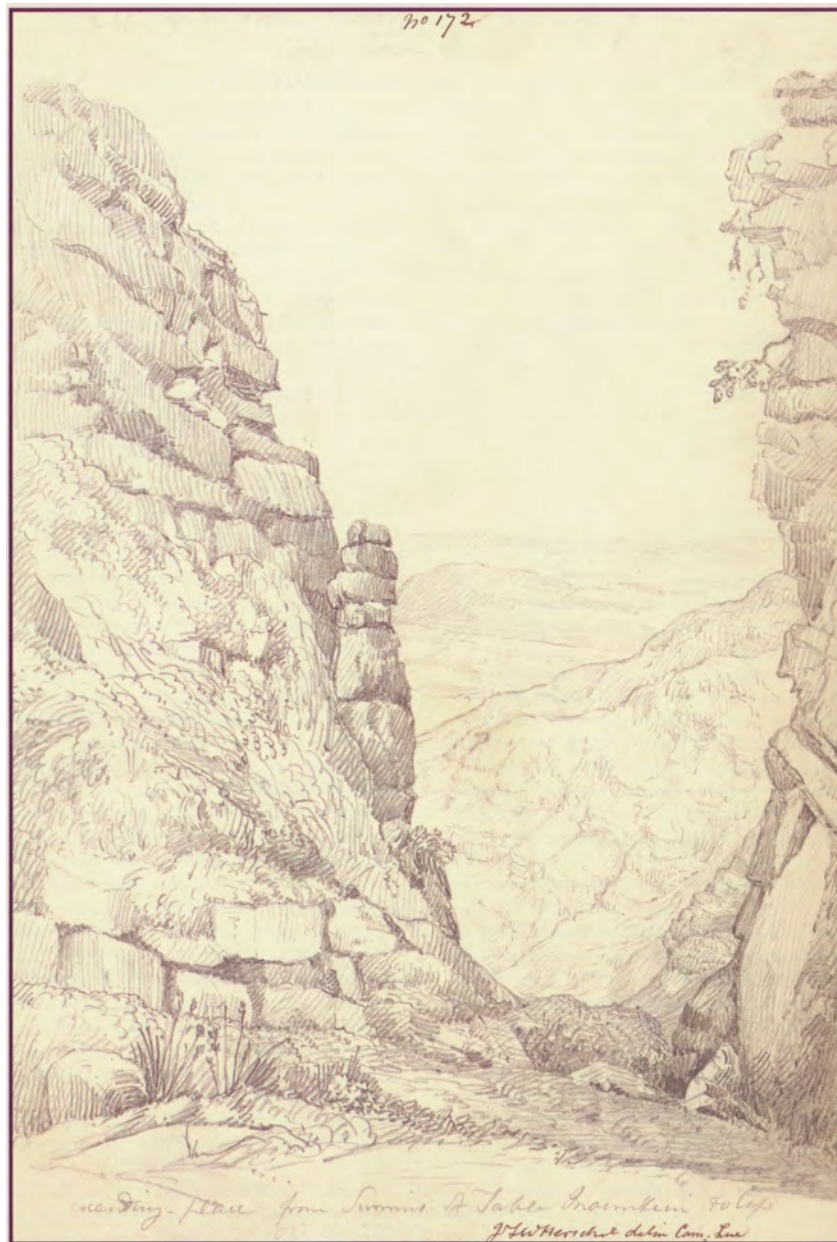


Mensa, 2013.

Walking along the Platteklip Gorge trail, Table Mountain, and recording data every 12 minutes.



Mensa, 2013.
Searching for Herschel's rock at the summit of Table Mountain.



JOHN HERSCHEL

Descending place from the Summit of Table Mountain to Cape Town, 1837.

Camera lucida drawing.



Mensa, 2013.

Sitting on the rock and matching Herschel's sketch to the perspective of the landscape.



Mensa, 2013.

In the process of making a rubbing of the rock, with soft pastel.

The work mentioned above is titled *Mensa*; the name of the constellation for Table Mountain. This is the only natural landmark mapped in the sky, with two stars representing the flat top of the mountain and the Large Magellanic Cloud⁹ representing the clouds that drift over the top of the mountain in summer, commonly known as the “tablecloth”¹⁰.

This constellation involves looking up at the sky and tracing an imagined mountain onto the celestial space¹¹. The record that I made of Herschel’s rock turns this relationship upside down since the resulting image, a nebulous texture of white soft pastel on black paper, suggests a celestial object. Turning my gaze down to the earth I have seemingly traced imagined stars onto the surface of the mountain. This superimposition between terrestrial and celestial space creates a tension in terms of scale: the nebula that the image seems to represent suggests a space that is light-years in length, yet in reality it is a one-to-one scale of a rock, no more than a metre wide. In terms of scale in time this rock, to me, presents an attempted connection to a single moment in history when Herschel observed this same space. The Large Magellanic Cloud on the other hand presents an image from history 158 200 years ago and just as distant in space.

9 The Large Magellanic Cloud is a satellite galaxy of the Milky Way. It can be seen in the sky as a hazy, cloudy shape (NASA, n.d.).

10 Another connection between the mountain and this galaxy appears in Herschel’s work. As mentioned earlier, his drawings of nebulae had an evolutionary purpose, with the intention for future generations to compare these drawings with subsequent appearances. An example is his representation of the Large Magellanic Cloud. Brian Warner remarks that he used the same principle in some of his terrestrial topographic drawings, such as a detailed sketch of Table Mountain (page 3), which was drawn with the purpose of investigating the rate of erosion over time (Warner 1992:55).

11 This mountain in the sky, although the only landmark to be depicted as a constellation, is not the only projection of a landscape within the practice of astronomy. Karel Nel explains the significance of this: “In their attempts to understand large scale structures and galaxy formation, astronomers often use a kind of topographical language to name, describe and locate the nodes of galaxy formation within the darkness... This kind of projected metaphorical labelling indicates a human effort to understand and claim the unknown through the known” (2008:5).

In this chapter I will discuss the significance of scale and distance in my work, in space as well as time. I will consider in particular the importance of calculation and measurement in my methodology. However, uncertainty and the possibility for error typically accompany most scientific calculations. For example, as mentioned in the previous chapter, Table Mountain affected De la Caille's scientific measurements for the shape of the earth. In consideration of this I will look at the value of the "flaw" and the "approximate" as related to the methodology and concepts in my work.

In *Six Stories from the End of Representation*, an interdisciplinary text on science and the arts, James Elkins examines the viewing experience of astronomical images at vast distances and at the very limits of not only normal vision but optical technology. He explains that at these magnitudes the images become incomprehensible, and intuitive understanding limited, as the observer can no longer grasp the relationship between his or her body and the image: "...it's the point – slightly different for each viewer – when things in the image stop working the way things in the familiar world works" (Elkins, 2008:93). It is at this point that mathematics is needed as an analogy to understand the image: intuition moves to calculation (Elkins, 2008:100). Unlike the intensely coloured, elaborate images of celestial objects that are widely presented in the media, these images, Elkins explains, "do not try to be pretty" (2008:89). He states:

It is a physical fact that the most distant object will be the least well seen and may make the least interesting, or at least the simplest, picture. And yet it is strangely compelling, this flat, colourless image of an object farther than almost anything else that can be seen (2008:111).

Why are these distant, dull astronomical images so spellbinding? Possibly because of the resulting curiosity that these "representation-less" objects spark; the imagination takes over and analogies are formed in an attempt to grasp what is being perceived. Barbara Stafford makes the following statement in a discussion on the increasing complexity of scientific knowledge and its reception: "Knowledge was not a given, it had to be performed. Understanding emerged out of innovation, the continuous struggle to bind an elusive infinity to a finite imagination" (2001:5). Elkins explains that it is at the threshold between calculation and intuition that these

distant astronomical images become interesting. As an example he cites small glass plates from the Lowell Observatory in Arizona; depictions of galaxies used before digital technology. The experience of viewing these plates as fragile and tiny becomes interrupted by the realisation of the enormity of the galaxies that are illustrated on this small scale (Elkins, 2008:95). These plates were originally intended for scientific research, but Elkins examines these objects from a different angle by focusing on the viewing experience rather than the specific information illustrated by the image. In this way he opens these objects up to examination beyond the traditional confines of science. His accounts can therefore also be applied to artworks, through this focus on viewer experience. The work by South African artist Richard Penn show parallels to the experience of viewing the Lowell Observatory plates, in which near and far, intuition and calculation overlap.

Like Elkins, Penn has a trans-disciplinary approach and often makes reference to astronomy in his work. He cites, for example, imagery taken by the Hubble telescope, but also incorporates observations from his personal life and in this way his work creates thought-provoking tensions in distance and scale. His interest in this concept started when he took close-up photographs of his father engaging in everyday activities. He then magnified these until they were at the brink of being unrecognisable. The photographs are indistinct and grainy, aesthetically similar to the vast astronomical images referred to by Elkins. Penn notes that the photographs reminded him of his childhood (Penn, n.d.). In my opinion this work represents an attempt to close a distance over time, to capture a memory. But ironically, the more he zooms in to detail, the more it becomes obscured. This process of narrowing distance through magnification, in fact, increases distance in the perception of the work as the close-up photographs start to resemble far-off galactic imagery. Penn explains:

So I was going into these images to get to something extremely intimate, suddenly everything opened up, the view opened into the vastness of space, also as ungraspable as that instant, that inherited gesture. Zooming in, and extracting, and all that, suddenly I found myself looking at the universe (quoted by Browde, 2010).

Penn's method of creating art as a process of inspection, only to be confronted by an expanding view, is reflected in a literal excursion present in Spanish artist Paloma Polo's work *Apparent Position*, 2012. This work is based on Sir Athur Eddington's expedition in 1919 to the island of Principe to observe a solar eclipse. His findings challenged the "apparent" position of stars by confirming that light can alter its linear course. Although detailed reports were kept on the calculations of the expedition, there were no photographic records of the actual experience, except for a stone monument that commemorates the event. This structure stood at the space where the observation took place. However, Polo's research showed that the observation took place at a different spot, albeit close by. As part of this work she created a 16 mm film transferred to HD video titled *Action at a Distance*. It portrays the process of moving the monument to this "apparently" accurate space. This small shift in position, irrelevant in the original expedition, is illuminated through the labour-intensive process of moving the monument, presented for a full 20 minutes on the film. Similar to Penn's photographs, this focus on intense accuracy in positioning the monument is counteracted by the ever "approximate" position of the viewer: time and space is vague, the viewer has no sense of how far the monument is being moved or how much time is passing. The sounds of the movement of the monument, for example the noise of the tractor, voices and the beating of hammers are intermittently muffled and juxtaposed with unknown sounds, effectively distancing the viewer even further (Uno, 2013). This causes the viewer to consciously question and reinterpret notions of distance and position within this context. The work offers insight into the context of Eddington's expedition and simultaneously hides it. It reflects the paradox of making a scientific investigation during a solar eclipse, "bringing to light" something during complete darkness. Polo explains: "My project also proposes this circumstance (this moment of darkness) as a metaphor to analyse the tensions implicit in the desire to define an experience, as an event and as a scientific experiment" (quoted by Checa, 2012).



RICHARD PENN, *Mirror 4*.

PALOMA POLO, *Action at a Distance*, 2012.
16 mm film transferred to HD video (still).

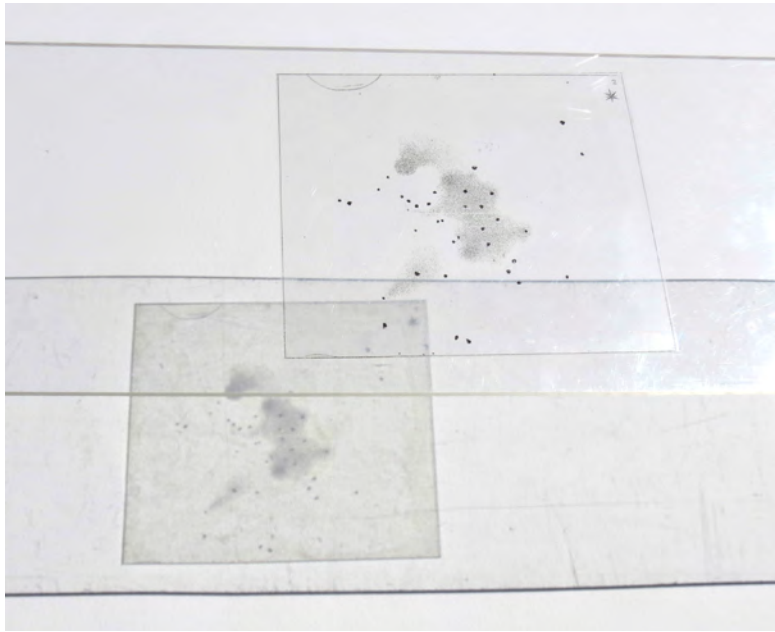
Karel Nel, a South African artist who has been actively involved in the Cosmic Evolution Survey (COSMOS)¹², makes the following observation which resonates with Polo's view: "It is only within the all-encompassing darkness that we are able to see light, acutely observe, record and attempt to comprehend the singularity of the briefest instant at the very beginning of our universe and an ever-expanding consciousness" (2008:6).

The methodology for my work is based on considered structures and calculations that reference scientific methods of observing and mapping. But like Penn and Polo's work, this intense process of recording and measuring allows for a paradox, a shifting interface between intuition and calculation, connection and disconnection, seen and unseen; an acknowledgement of the inherent ambiguity and the possible need for imagination in order to comprehend the environment.

The works *Eight Minutes Earlier* and *A Tree as Time* aim to challenge perceptions of scale in both time and space. *Eight Minutes Earlier* consists of a triptych of small pen drawings. I created these works by suspending individual reproductions of Herschel's nebulae drawings, from his publication *Results of Astronomical Observations Made at the Cape of Good Hope*, onto a transparent platform. With a sheet of paper placed underneath this setup I sat outside and plotted the shadow of the drawing that fell on the paper. After every 12 minutes I repeated a drawing of the shadow, which kept shifting due to the movement of the earth. The time of day on which I started these sessions corresponded to the time during daylight that the particular nebula would "rise" (appear on the horizon), reach "noon" (appear at the highest point in the sky), or "set" (disappear on the horizon) and the relationship between this instant and the time that the sun would rise, appear at its highest point or set.

A Tree as Time is a three-metre-long drawing. As mentioned in the introductory chapter, this work is based on an old oak tree that grows within the space where Herschel's telescope stood when he visited the Cape.

12 This is a project with the Hubble Space Telescope to obtain high resolution images of galaxies in a two degree square area of sky. In his work Nel uses 540-million-year-old carboniferous dusts and radiant white salt, materials related to the formation of stars (Nel, 2008:5).



Eight Minutes Earlier, 2012 (process).

A Tree as Time, 2013 (process).

I created this drawing by plotting the dappled sunlight that shone through the leaves of the oak tree and onto the paper laid out in the tree's shadow. Using diluted Indian ink, I followed these light shapes over time as it moved across the paper from right to left.

Eight Minutes Earlier involves a translation from the vast scale of nebulae to small scaled pen drawings. This superimposition of magnitudes causes the image to hover on the threshold of intuition and calculation, similar to Elkins's account of the Lowell Observatory glass plates¹³. *A Tree as Time* reverses this leap in scale: this large scale drawing suggests minuteness since the depicted marks are suggestive of microscopic cells or a magnified view of the dotted mark making in the *Eight Minutes Earlier* series. These works also suggest multiple scales in time intended to challenge and re-evoked the viewer's perceptions of the passage of time. In *Eight Minutes Earlier* a fast duration is illuminated by the evidently shifting positions of the shadows¹⁴. Simultaneously, a long duration is suggested between the present instance and 178 years ago when Herschel observed these nebulae. But what follows is a sudden offset by a very short moment, referenced in the title of the work: over this period of 178 years the calculated times at which these celestial objects are located at a specific point in the sky have changed with only eight minutes. *A Tree as Time* similarly suggests an accelerated timespan through my method of attempting to capture evading shadows. However, this is layered over the slow growth period of this tree, suggested by *A Tree as Time as a Line*, a subsequent translation of this work which represents the measurement of the tree's girth and symbolises its possible age of 175 years.

13 The translation from stars to shadows holds another type of tension between intuition and calculation, which echoes Nel's quote on the paradox of darkness, seen and unseen. Although we cannot perceive celestial bodies due to the brightness of the sun, I drew these nebulae by using the sun as a tool (by plotting shadows).

14 Each subsequent drawing of a shadow presents a significant shift in position within 12 minutes. Therefore my process of "capturing" the shadows needed to be quick. Each work was created at a different time of the year, which can clearly be seen by the differences in angle of the shadows' courses.

Time Trace is aimed at challenging the perception of scale in time through a focus on chronological measurement. The work consists of a series of cyanotypes; a photographic technique based on chemicals with iron compounds and exposure by UV rays, invented by John Herschel in 1842 (Fabbri & Fabbri, 2000). I prepared a sheet of paper according to the chemical cyanotype technique and laid the paper outside in the sun with an hourglass placed on top. The UV rays of the sun exposed the sections of the paper that were not covered by the hourglass's shadow, and in this way created a shadowgram. Each print in the series was created at a different time of day. Due to the changing positions of the sun throughout these different time periods, the duration of UV exposure to the paper also varied. Each shadowgram is therefore an inscription of a specific moment in time and a specific duration. Yet the work is also aimed at disrupting the linear measurement of time. Since the length of the hourglass's shadow varies in each print, the distance between the top segment of the hourglass and the bottom segment also varies. These two segments can be said to stand for a present moment (the running sand) and a past moment (the fallen sand) and the varying distances between these moments suggests an alternating duration between past and present. One of the prints presents a very short shadow where the two segments overlap. This suggests a nearly-closed distance between past and present, which echoes the project's focus on the creation of a connection over two time periods; the present and the 19th century.

Since the project is also an investigation of my own connection to the environment, the relative distance between myself and the represented space becomes an important feature in the work. The setup for creating *Eight Minutes Earlier*, namely one surface raised above another, is a visual signifier of this distance. This setup is also present in *12 Steps to the Lagoon Nebula*. For this work I made a representation of Herschel's drawing of the Lagoon Nebula by laser cutting small holes into a Perspex plate according to the pattern of Herschel's drawing. I suspended this plate over a brass etching plate and sprayed acid over the design while using the Perspex plate as a stencil. I repeated this process 12 times, each time at a closer distance to the etching plate and leaving the acid to bite on the plate for a longer time period.

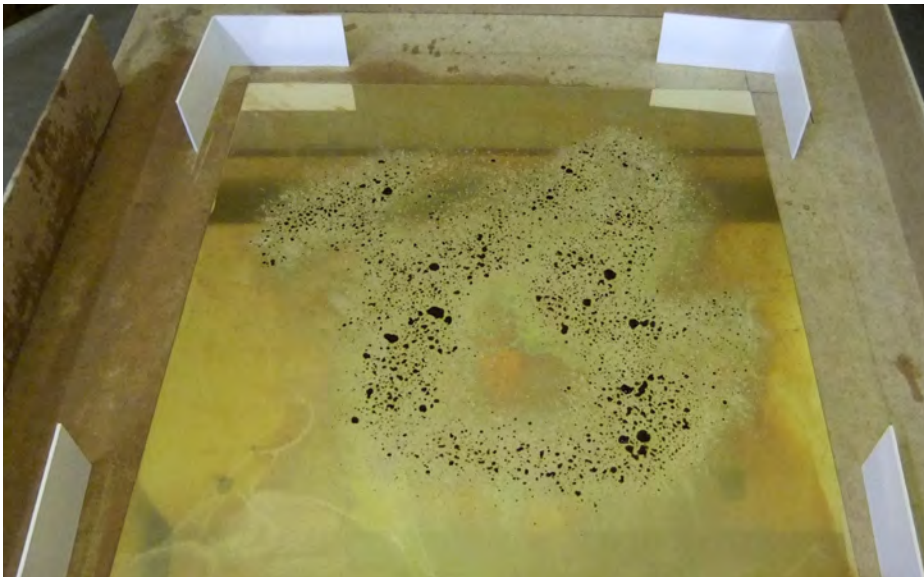
After each step I made a single print with white ink on black paper¹⁵. The resulting series of 12 prints acts as a documentation of this process¹⁶. This work draws specific attention to the relationship between the two surfaces in the setup: the initial distance between the Perspex plate and the etching plate (50 mm) was calculated in relation to the actual distance between the Lagoon Nebula and the earth in time and space (5 000 light years), (NASA, 2013) that is according to a scale of $1:1 \times 10^{22}$. However, from this point, scale becomes distorted. The scientific relationship between time and space is inverted since the distance between the surfaces decreases while the time that the acid is left to form the image increases (the closer the stencil gets to the etching plate, the longer it takes before the next step).

These scale models that represent distance are reflected in my own embodied distance in time and space in the works *Mensa* and *A Tree as Time*. For these works I engaged with specific spaces. *Mensa* involved a search for a rock from which Herschel drew the landscape¹⁷. There is no certain way of knowing whether this rock is the correct, historical spot where Herschel sat. Instead, it stands for my personal attempt to close a distance over space; it becomes an approximation, an imagined possibility.

15 The work *Paralipomenon I* is a set of the cardboard steps used for the production of *12 Steps to the Lagoon Nebula*. “Paralipomenon” is defined by the Oxford Dictionary as “things omitted from a work and added as a supplement”. *Paralipomenon II* consists of brass shavings from the manufacturing process of *Sound Sweep*, as well as perspex circles that are residues from lasercutting the Perspex disks for *Sound Sweep* and *12 Steps to the Lagoon Nebula*.

16 The number “12” was found by calculating the average amount of repetitions of the shadows in *Eight Minutes Earlier*. This number, significant also in the measurement of time; 12 hours on the clock and 12 months in a year, makes its appearance in several of my works, in some cases intentionally and in other cases purely by chance.

17 This idea was initiated by Professor Brian Warner, who explained to me how to search for the rock by using Herschel’s drawing of the location as a finding sheet (Warner, personal communication 2012, October 20).



12 Steps to the Lagoon Nebula, 2013.
Detail of acid sprayed over the stencil.

The etching plate after the stencil had been removed.

A Tree as Time involves an attempt to close a distance over time since it is based on the possible age of a tree¹⁸. Both the age of the tree and the position of the rock can never be confirmed and the accuracy of this information is, in fact, irrelevant. The significance lies in the process. The possibility that this information might be flawed is an acknowledgement of distortions in scientific calculation and the inherent subjectivity within science.

The foxing patterns in Herschel's *Results of Astronomical Observations Made at the Cape of Good Hope* are unwanted stains, flaws that disturb the interpretation of the intentional data. And yet, as explained in the previous chapter, these marks have value as they draw attention to a blind spot in scientific representation, regarding context, subjectivity and process. The etching process in *12 Steps to the Lagoon Nebula* references foxing marks in its visual form as well as its production, namely acid corroding a surface over time. It further alludes to the presence of disorder through the random dispersal of marks on the etching plate. This "nonpattern", however, took its shape from the strict pattern of the Perspex stencil. I based the stencil's design not only on Herschel's nebula drawing, but also on the structured pattern of sound waves: the holes are evenly spaced and arranged in concentric circles (this design is used to create actual sounds in the work *Sound Sweep*, which will be discussed later). While this design is a visual equivalent of sound, the stencilled etchings formed from this design are visual equivalents of noise. This almost symbiotic relationship between order and disorder is also present in the work *A Tree as Time as a Line as a Sound as a Breath*. This is the last work in a string of translations following on from *A Tree As Time*. For the preceding translation, *A Tree as Time as a Line as a Sound*, I

18 Rebecca Solnit, in *A Field Guide to Getting Lost*, writes about the concept of distance and remarks that we often want to overcome a distance in space or time (as with a faint memory). She suggests that the feeling of longing over a distance could rather be cherished for what it is: an acknowledgement and appreciation for the unreachable space in between. She relates the colour blue to distance and explains that light in the blue end of the spectrum disperses in the earth's atmosphere: "This blue is the light that got lost" (2006:29). This "lost light" is the reason for the blue colour of the horizon and far-off spaces. She explains this hue as "the colour of there seen from here, the colour of where you are not. And the colour of where you can never go" (2006:29). This concept resonates with my aims for *A Tree as Time* and *Mensa. Time Trace* is also tied to this theme through Solnit's reference to the rich blue colour of the cyanotype, as an ode to this colour of distance (Solnit, 2006:29-34).

treated the length of the tree's measured girth as a wavelength of sound and calculated which frequency will have this specific measurement in length. The resulting note, F2, is a fundamental frequency on the French horn. I had a sound recording made of myself playing this note on the instrument in one full breath. *A Tree as Time as a Line as a Sound as a Breath* is a single measurement (0.3 ml) of the amount of condensation that resulted from the instrument after I played the note. Condensation in brass instruments is unwanted residue and creates noise when it is present while the instrument is sounding. Yet in this work it draws attention to my breathing and the influence of my body in the process of creating this work. The condensation, however, is presented only as a written measurement: order (intended sound) has been translated to disorder (unintended residue) and once again to order (intended measurement). In the following chapter I will discuss this concept of translation in more detail, with reference to the formation of associations and trans-disciplinary connections.



The oak tree that currently grows near the space where Herschel's telescope stood until 1838.

CHAPTER II.

A TREE AS TIME AS A LINE AS A SOUND AS A BREATH

**5 February 1838, Cape Town**

It is a clear night, superb for star gazing. John Herschel is observing the sky with the 20-foot reflector telescope, which stands in an orchard at his residence, Feldhausen Estate. The clearing is enclosed by trees. They cloak the stars on the horizon but also subdue the strong South Easter wind. The Table range of mountains can be seen in the distance, covered with dense woods. Near the telescope stand two apricot trees, a pine tree, a pear tree and a Keurboom. A young oak tree grows a few steps away¹⁹.

21 February 2013, Cape Town

It is 11:00, a clear summer day. The oak tree, now 175 years old, grows on the pavement against the fence of Grove Primary School in Claremont. Children are playing during their school break and their voices sound from behind the fence. A few steps into the schoolyard stands an obelisk that was built in 1841 by friends of Herschel. It commemorates his scientific contributions in the Cape and marks the spot where his telescope used to stand. The shadow of the oak tree falls to the other side of the school fence, onto the yellow line in the street. I am sitting in this shadow and plotting the dappled sunlight that shines through the leaves and onto the paper that I have laid out on the pavement. The space is enclosed by buildings and the sky on the horizon can barely be seen. In the distance, between the buildings, is a view of the Table range of mountains.

¹⁹ These accounts are based on factual information from Brian Warner's publications *Sir John Herschel at the Cape of Good Hope* 1992, and *Flora Herscheliana: Sir John and Lady Herschel at the Cape 1834 to 1838*, 1996.

A Tree as Time as a Line as a Sound as a Breath is a series of works that follow on from one another in a string of translations: a drawing of the dappled sunlight through the oak tree (*A Tree As Time*) becomes a suspended brass line of 3 920 mm, the length of the tree's girth (*A Tree as Time as a Line*). This work becomes a sound recording for which I played the frequency associated with the wavelength of 3 920 mm on the French horn (*A Tree as Time as a Line as a Sound*). Finally this becomes a measurement – 0.3 ml – the condensation that resulted from playing this note for the duration of one full breath (*A Tree as Time as a Line as a Sound as a Breath*). This work is based on a formation of connections. I mentioned previously that *A Tree as Time* is a personal attempt to close a distance over time. In this way the oak tree becomes a suggested connection between my experience of my own reality and that of Herschel 175 years ago. In each translation that follows this work the original concept of the oak tree grows through the creation of more connections, dissipating at last into a single breath. And in this last translation, through its reference to my breathing and my own girth, the line of translations is tied back in a full circle to the original girth of the oak tree.

The previous chapter referred to James Elkins's view of analogising through calculation when phenomena such as distant celestial objects extend beyond intuitive understanding. In this chapter this concept of analogy will be revisited, but while Elkins focused specifically on mathematics as a form of translation through which to grasp equivocal phenomena, I will broaden the scope and consider the creation of connections and translations across disciplines, in specific between music, art and science.

The creation of trans-disciplinary connections was most prevalent before the Age of Enlightenment in the 18th century, which favoured rationality and denied what Barbara Stafford describes as a "...mobile, interconnected universe of correspondences, predicated on the imaginative leaps of analogy..."²⁰ (2001:170).

20 Herschel pursued a diversity of disciplines and seemed to be in favour of inter-reference between science and other disciplines. Larry Schaaf makes the following statement: "John Herschel recognised no man-made barriers between what we call science and what we call art; the qualities of both contributed to his intellectual appreciation of man's place in the world. Ultimately, we must conclude that they both represented Truth to him..." (Schaaf, 1989:10).

For example, Leonardo da Vinci made an analogy between the human body and geography²¹ while Plotinus formulated a connection between the diseased body and the celestial space (Stafford, 1999:168). Another example is Ptolomy, who also created a connection between the body and the celestial space. However, he took it even further by including the discipline of music and created connections between changes in the human soul, harmonic modulations and the motion of celestial bodies (Stephenson, 1994:35). Ptolomy was not the only scholar to connect ideas between the disciplines of music and astronomy. This connection, often referred to as *Music of the Spheres*, has a history that goes back at least as far as Plato. Bruce Stephenson, in his book *The Music of the Heavens*, suggests that the tradition of linking these two fields possibly started from an idea accredited to Pythagoras: musical sound is produced through friction and therefore celestial spheres should also create sounds due to their circular rotations at great speeds (Stephenson, 1994:16). Many of the theories that followed, however, were not based on a literal connection (planets that literally produce harmonic sounds), but rather on association or metaphor²². Johannes Kepler, who produced the most substantial publications on music and astronomy, was not concerned with physical sounds. Instead his work was based on geometric proportion and relation and his aim was to use musical theory in order to give an account of the harmonic principles in the natural world (Stephenson, 1994:3-4).

Since Kepler's publications, the scientific understanding of the environment has developed immensely through technology and research and hence the scientific basis of the *Music of the Spheres* theories is no longer relevant. However, as can be concluded

21 He stated the following: "By the ancients man has been called the world in miniature; and certainly this name is well bestowed, because, inasmuch as man is composed of earth, water, air and fire, his body resembles that of the earth; and as man has in him bones, the supports and framework of his flesh, the world has its rocks, the supports of the earth; as man has in him a pool of blood in which the lungs rise and fall in breathing, so the body of the earth has its ocean tide which likewise rises and falls every six hours, as if the world breathes; as in the pool of blood veins have their origin, which ramify all over the human body, so likewise the ocean sea fills the body of the earth with infinite springs of water" (quoted by Stafford, 1999:167).

22 Plato, for example, related the distance of planets to musical intervals. Ptolemy connected the rising and falling of pitch in music to the motion of planets alongside the celestial equator: low sounds were acquitted with rising and setting points, and high sounds to the planets' highest position above the horizon (Stephenson, 1994:19,36).

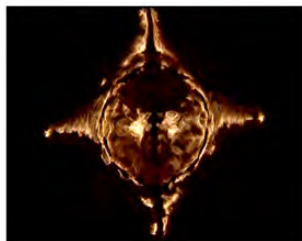
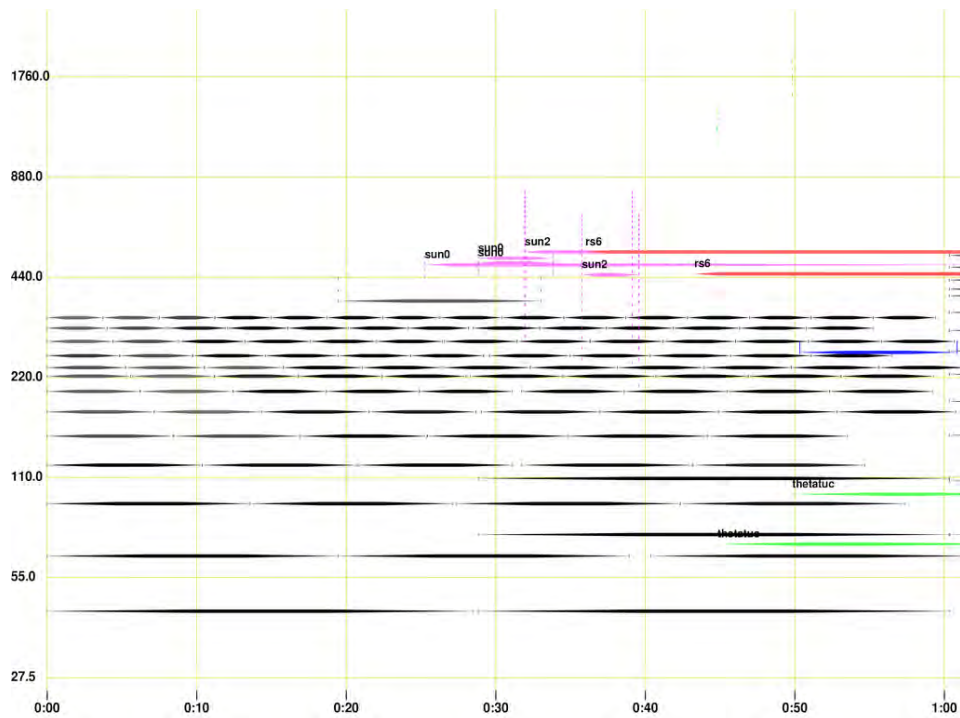
from Kepler's focus on harmony, the long-term significance of these theories does not lie in its scientific accuracy but rather in the theorists' endeavours to create connections and patterns across the spaces that they perceived as an attempt to comprehend it. This process of connection is especially relevant in the current timeframe: the more accurate scientific exploration is becoming, the more destabilised a perception of space seems to become. For example, scientists now know that 96% of the universe consists of dark matter and dark energy. Of the 4% that we are apparently aware of, only 10% is visible matter. The entirety of what scientists can observe therefore consists of only 0.4% of the known universe (CNRS, n.d.).

An example of the significance of connectivity in the contemporary timeframe is the collaborative project by musician Jenő Keuler and scientist Zoltán Kolláth titled *Stellar Music No.1*, 2005. This work revisits the *Music of the Spheres* theories but with the inclusion of contemporary technology. It is based on a connection between the acoustic properties of pulsating variable stars and musical instruments. These stars create sound waves very similar to musical instruments due to their periodic oscillations that create steady standing waves. The sounds cannot be perceived by the human ear since the frequency range is much lower than our audible range. However, the pulsing actions of the stars give way to changing luminosities and this can be observed visually and translated to the stars' acoustic activities. Keuler and Kolláth translated this acoustic data into music by transposing the sounds of the stars to audible frequencies. They treated the stars as different "musical instruments" and created an original music composition. The score that accompanies the sound piece presents a visual translation of the sounds, created according to a system of visual codes for timbre, dynamics, frequency and rhythm (Keuler & Kolláth, 2005:161,167). This work involves connections across the sense modalities of sight and hearing on the one hand, and across the disciplines of science and music on the other hand. Visual scientific data leads to auditory scientific data, which leads to a musical sound recording and a visual music score. Ptolemy, in his theories on music and astronomy, linked these two disciplines precisely through the senses of sight and hearing.

He attributed sight to astronomy and hearing to music and believing that these were the highest of the senses, claimed that music and astronomy are therefore connected in their foundations of perception (Stephenson, 1994:35).

The work *Hermetica*, 1993 by Susan Derge, an artist from Devon, England, likewise concerns connections between sight and sound. However, this work inspires multiple connections as the artist omitted the original referent of her work completely. *Hermetica* is a film of more or less six minutes that shows a ring-like shape, reminiscent of a solar eclipse, against a black background. As the film progresses the shape evolves and transforms into different configurations. This is a single drop of mercury in a speaker cone filmed while a low pitched sound that gradually rises to a higher sound is played through the speaker. Starting from a still, circular drop, the mercury begins to vibrate in resonance with the sound, forming a variety of geometrical patterns that become more intricate as the pitch of the sound rises, until, when the sound fades out into silence, it settles once again into a circular form. This work is based on an acoustic experiment cited by Hans Jenny in 1967 in his publication *The Structure of Dynamics of Waves and Vibrations* (Pettersson, 2009). However, the experiment has been transformed to suggest connections to ideas outside the original scope of the experiment. The background of the film is pitch black and while the speaker cone is completely concealed, the mercury drop itself is visible only through the light of the camera eye reflecting onto it. The visual quality of the reflected light transforms the original characteristics of the mercury from a highly poisonous substance with a cold, silver colour, to a shape with an organic quality and warm, amber colour. I associated the evolving shapes in the film with other patterns found in nature: a sea urchin or butterfly wings, with the last, intricate circular formations suggestive of the circular view from the tube of a microscope, revealing a vibrant microcosm. In this way the work points to the human desire to seek patterns.

The associations in Derge's work are my own imaginings and not apparent in the work. Barbara Stafford focuses on the neurological activities involved in this viewing process in her publication *Visual Analogy: consciousness as the art of connecting*. She discusses the significance of analogy in the brain's processing of sensory information and notes: "Seeing is about being struck that something is, or can be, connected



JENŐ KEULER AND ZOLTÁN KOLLÁTH, *Stellar Music No. 1*, 2005.
Visual score of the first minute of the composition.

SUSAN DERGES, *Hermetica*, 1993 (stills).

to something else” (1999:138). She argues that the experience of viewing art can reflect and demonstrate the way in which the brain connects, combines and orders heterogeneous information that comes from perceiving the environment. As an example from art history she cites photomontage, which requires the viewer to connect unrelated elements that the artist has joined together (Stafford 1999:144-146). Perceiving is therefore not mere recording, it involves a cognitive action through analogising. Stafford notes: “...reality is the end product of the imaginative creation of categories we constantly stretch to grasp” (1999:146). In my opinion, artworks such as photomontages as well as *Stellar Music No. 1* and *Hermetica* do not only reflect neurological activities but also influence them. The observation of phenomena from different angles and disciplines as different “lenses” can possibly inspire the cognitive creation of new perspectives and ideas; alternative views of the environment. Kepler created a connection between poetic metaphor in the field of art and rational calculation in the field of science and in this way opened up both these fields to new thought processes through analogy, challenging the established boundaries of art and science. This challenge is evident in the general reception of his work: he was criticised in his own time for reasoning about concepts that were thought to be beyond rational discussion, and criticised in the contemporary times for reasoning about concepts that were thought not to be worthy of rational discussion (Stephenson, 1994:9). In *Stellar Music No. 1* Ptolemy’s neat categories of sight and hearing with astronomy and music become entangled and the viewer is left with an alternative perception: stars are heard (through the focus on translating stellar acoustics to audible sound) and music is seen (through the focus on the visual score, which is traditionally not considered as part of the experience of perceiving a work of music).

Douglas R. Hofstadter, in his book *Gödel, Escher, Bach: an eternal golden braid*, creates connections between the fields of mathematics, music and art and brings them together into a focused discussion on the paradox. This is a challenging topic. It is ambiguous and very difficult to grasp; almost similar to Elkins’s distant astronomical images discussed earlier. Yet, through considering this from three different disciplines and from different angles, Hofstadter enriches the reader’s comprehension of this concept. He specifically discusses Gödel’s Incompleteness Theorem from 1931,

a self-referential theory which brought a paradox into the principles of mathematics. He relates this visually to Escher's illusion works and acoustically to J. S. Bach's music. For example, he explains that Escher's lithograph *Waterfall* forms a never-ending, paradoxical cycle of six steps. In Bach's *Canon per Tonos* from *The Musical Offering*, the main theme modulates in six steps until it reaches the original key, becoming, like Escher's work, a never-ending loop (Hofstadter, 1979:10-19).

Similar to Hofstadter, I related my artistic work to science and music. The body of work is primarily structured according to three variations that branch out from the main stem, namely a section based on a connection to the celestial environment, a section based on a connection to an oak tree and a section based on a connection to Table Mountain. Each of these groups then branch out further into subsequent translations.

Many of my works can be connected through their visual mark making, literally and figuratively becoming a process of "connecting the dots". The small pinpoint marks in *Eight Minutes Earlier* are reflected in the larger circles in *A Tree as Time*. The circles in *Time Trace* are similar in scale but inverted in hue, and the dots in *12 Steps to the Lagoon Nebula* are similarly inverted but scattered, which are repeated as an ordered pattern on the plate in *Sound Sweep*.

In addition to these connections between elements of the works, there are also arbitrary links; relations that are not apparent in the perception of the works and which, in reference to Stafford's theory discussed earlier, demand the imagination of the viewer. *Sound Sweep* is a work that makes strong reference to the historical theories *Music of the Spheres*. It is based on Cogniard de la Tour's siren, a 19th century acoustic device sited by Herschel in his publication *Physical Astronomy. Sound. Light*.²³ This sculpture²⁴ consists of a spinning disk with evenly spaced holes that are structured

23 De la Tour's siren consisted of a disk perforated with equally spaced holes and arranged in concentric rings. The disk was rotated with wheelwork and a small aperture was held directly underneath the ring of holes, while air from bellows was blown through the aperture (Herschel, n.d:777). The current of air, in collaboration with the intermittent holes spinning past, produced constant air vibration and hence audible sound. The sound was affected by the distance between consequent holes, the size of the holes and the speed of the disk (a ring of holes at the rim of the disk produced a higher sound than a ring of holes closer to the axis).

24 This work was produced with the production support of the UCT Physics workshop.

concentrically. The holes in their entirety form a representation of one of Herschel's nebulae drawings, namely the Lagoon Nebula. A brass device that is suspended over the plate supplies an airflow which creates sounds through the passing holes. This device references a sextant, a 19th century instrument used to measure the stars. By manually rotating this device over the plate, the viewer can "survey" the image and its resulting sound.²⁵ The sound produced by *Sound Sweep* is an indexical sign of the image since the visual representation of the stars is literally also the sound source. Yet, the perceived association between the sound and image is not as apparent since the image and sound cannot be experienced together. The image can only be seen when the plate is still and the instrument is quiet. When the instrument is sounding the plate spins and the image transforms into a blur of lines. In *A Tree as Time as a Line* and *A Tree as Time as a Line as a Sound* the connections follow a similar tendency: the sound is directly linked to the brass line through a mathematical measurement, but the association between the characteristics of the visual line and the auditory note is not apparent: the note has a low frequency and hence a heavy character, which contrasts with the lightness and delicacy of the line. This deep sound also contrasts with that of *Sound Sweep*, which is shrill and mechanical. The third sound work in my exhibition, *Mensa: 12 Movements*, while similar in timbre to *A Tree as Time as a Line as a Sound*, introduces a different element through its emotive quality and reference to the structure of classical music.

Mensa: 12 Movements follows on from the process of searching for the rock that Herschel sat on while drawing the view from Table Mountain. This work is based on a selection of data that myself and three friends took in 12 minute intervals during the walk to Herschel's rock, starting from the beginning of the trail until we reached the rock.

25 The title of this work is based on Herschel's observations with the 20-foot reflector telescope, which he called "sweeps". Similar to the telescope, which Herschel moved to and fro in an arc as the earth's rotation made different views accessible to the eyepiece (Warner 1992:31), *Sound Sweep* is based on the movement of a brass device over an arc while different segments of the rotating disk pass under the airflow nozzle.

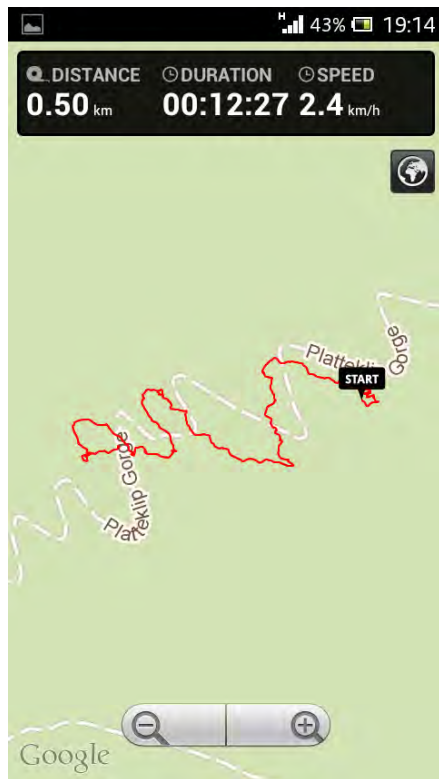
The number of data entries coincidentally happened to be 12²⁶. I developed this work further by translating each 12-minute movement of the hike to a movement in music by connecting each type of data recording to an element in basic, Western Classical music structure²⁷. The work takes the form of a map; a visual presentation of this translation process. This is accompanied by 12 separate scores, which are translations of the map to music notation, and a sound recording of the 12 movements, performed by myself on French horn. Each melody has a duration of one minute, being 12 minutes in total.

The translation system for this work is complex and the links are not immediately apparent, similar to the connections in *Sound Sweep* and *A Tree as Time as a Line as a Sound* discussed earlier. The aim is for the viewer to become a participant in the creation of connections and translations between the various forms of this work. *Mensa: 12 Movements* is presented on a table where the viewer is invited to handle the individual notation sheets, listen to the sound recording through earphones and examine details of the map through a magnifying glass. By imagining the connections between the individual movements and between each movement and its corresponding music score and sound recording, the viewer becomes involved in the process of translation.

The method of translating the data from the walk on Table Mountain to sound followed a strict and considered structure, similar to the methods in other works as discussed in the previous chapter. This is echoed in the form of presentation, that is, a

26 Coincidental connections have sprung up throughout the process of creating this body of work and my joy in finding these connections have made me aware of my own inherent search for patterns and analogies. For example, after measuring the girth of the oak tree for *A Tree as Time* in an attempt to determine the tree's age, I came upon a drawing by Herschel which depicts an old oak tree in front of the Feldhausen Estate. On the tree was a pencil note, for which Herschel recorded the girth of the tree as 12 feet 10 inches: only 8 cm less than my measurement (Warner, 2006:44).

27 The GPS routes, recorded with the cellphone application *Sports Tracker*, is relational to the melody line of each 12-minute movement. The amount of footsteps that I took, recorded with a Pedometer, is relational to the metronome tempo for each melody. The direction that we faced after each interval, recorded with a compass, is relational to the key of each melody. The distance for each interval, recorded with the cellphone application, is relational to the chord used for each melody. Lastly, the temperature for each interval, recorded with a thermometer, is relational to the mode of each melody, namely minor or major.



Time	Reading ①
07:24	716
07:36	712
07:48	873
08:00	1201
08:12	1823
08:24	2278
08:36	2650
08:48	2757
08:50	3099
09:12	3285
09:24	3608
09:36	3925

Time	Reading ①
7:24	143° SE
7:36	299° NW
7:48	267° W
8:00	314° NW
8:12	230° SE
8:24	336° NW
8:36	280° N
8:48	190° S
9:00	315° NW
9:12	265° NW
9:24	275° W
9:36	175° S

Time	Degrees	Percentage ①
7:25	24	69
7:36	23	49
7:48	23	51
8:00	25	57
8:12	28	51
8:24	29	50
8:36	29	48
8:48	30	68
9:00	30	47
9:12	30	44
9:24	29	44
9:36	30	41

Mensa: 12 Movements, 2013.

Data recorded during the walk to Herschel's rock.

map, which references the scientific attempt to structure and order the environment. The original data was recorded in an activity through which I annexed the environment through my search for Herschel's rock. The use of the French horn recalls this idea. This orchestral music instrument originated from the hunting horn, a French outdoor signal instrument used in the 17th century during the Hunt – a favourite sport of the nobility (Ericson, 2012). This instrument was shaped in a large brass circle to fit around the huntsman's shoulder. The instrument was played to encourage the hunting hounds and to give signals to the rest of the hunting party (Myers, n.d.). The focus of the hike and the recorded data is exploration, excursion, expedition, the communal preposition of these terms meaning "outside" or "away from". However, the translation of this data into the discipline of music introduces a new perspective to this work: it turns the focus from the environment to the observer. The melodies are subjective and emotive since they involve my own interpretation of the score through choices such as dynamics and phrasing. The resulting sound becomes an introspective sketch of the original hike. Although the instrument references outdoor sport, it also resonates with this inversion in its design. Unlike other brass instruments where the sound is directed away from the performer, the French horn's bell faces the opposite direction: to the performer's right hand and body. The act of playing the instrument therefore presents a cycle: I create a sound through the mouthpiece and away from my body and this sound is at last emitted back to my body. This idea resonates with the translation process of *A Tree as Time as a Line as Sound as a Breath* mentioned at the beginning of this chapter; a line of growing connections that at last refers back to myself. In the following and last chapter I will consider this reference, namely an inverted direction and a focus on the observer.

CHAPTER III.

THE MIRROR OF THE TELESCOPE

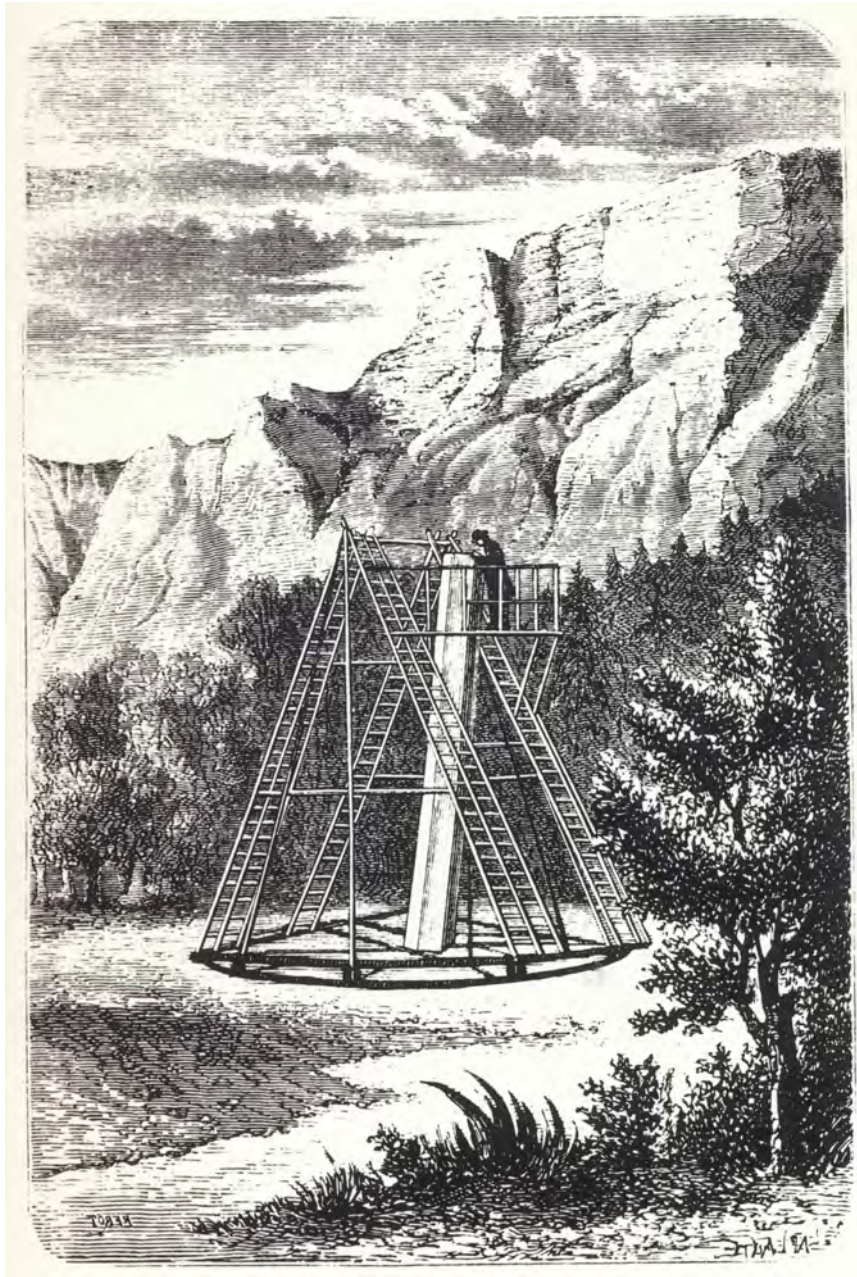
18 December 1834, Cape Town

It is a cloudless evening. John Herschel peers through the eyepiece of the 20-foot reflector telescope. His mechanic, John Stone, sweeps the sky by slowly raising and lowering the telescope. He keeps the distances within three degrees. As the earth turns on its axis different views of the sky pass by the eyepiece of the telescope. The high-pitched sound of a bell rings through the quiet night air: Herschel is signalling Stone to reverse the telescope's motion upwards. A lower sound signals him to move the telescope downwards. Within this rhythm of oscillating sounds and stars Herschel finds the celestial object that he has been looking for and indicates to Stone to stop the telescope. By the light of a lantern, kept dim so as not to disturb his eyes' adaptation to the dark, he starts to plot the Great Nebula of Orion²⁸.

27 May 2012, Cape Town

It is a cloudless afternoon, 14:00 – the calculated time at which the Great Nebula of Orion is located at its highest position in the sky in relation to the earth. I am sitting outside and a reproduction of Herschel's drawing of this nebula, printed onto a transparency and suspended on a platform, rests on my table with a sheet of paper placed underneath. I start to plot the shadow of the drawing that falls onto the paper. After every 12 minutes I repeat a drawing of the shadow, which keeps shifting due to the movement of the earth (the earth moves three degrees in 12 minutes). I draw until the sun sets, the shadow becomes faint and dissipates.

²⁸ This account is based on factual information from Brian Warner's *John Herschel 1792 to 1892: Bicentennial Symposium*, 1992 and *Cape Landscapes*, 2006.



A depiction of how Herschel would have gazed through his telescope, from *L'Astronomie Pratique et Les Observatoires*.

My process of creating the abovementioned work, *Eight Minutes Earlier*, is intended to reflect Herschel's methodology of observing and plotting stars through a telescope. While it may seem that I am tracking the movements of the represented nebulae, I am in actual fact recording my own movement through space as well as my position in the environment. This inversion is surprisingly also reflected in Herschel's process: when using the 20-foot reflector telescope, Herschel would stand in a movable gallery at the top of the telescope and look down into the tube (Warner, 2006:67) as if he was not examining phenomena from outer space, but rather his own position within the space that he occupied.

An image from *L'Astronomie Pratique et Les Observatoires*, 1874 depicts the way in which Herschel would have gazed into the 20-foot telescope. This is also known as the Herschelian manner, after the astronomer William Herschel, John Herschel's father (Warner 2006:68). This chapter will be based on this image. The focus will not be on the phenomena viewed through the telescope, but rather on the small part of the telescope's mirror that reflected Herschel's head when he looked down into the tube. Technically this didn't cause any important loss of light onto the mirror (Warner, 2006:67). Yet, this small intervention stands for a significant aspect of scientific observation, that is, the presence of the observer and context within the observed, and the role of subjectivity in the process and method of scientific representation.

John Herschel acknowledged his individual standpoint within scientific representation. In a paragraph in *Preliminary Discourse*, 1832 he wrote of his experience as a scientist, quoting Shakespeare: "...one would think that Shakespeare [sic] has such a mind in view when he describes a contemplative man as finding 'Tongues in trees—books in running brooks—sermons in stones—and good in every thing'" (quoted by Schaaf, 1989:17).

While this quote attempts to explain the inquisitive mind of the scientist, it can perhaps also be read as an acknowledgement of subjectivity in the observation of the natural environment; that the imagined texts, proses and sermons of the observer are already inscribed within the observed phenomenon itself. Lorraine Daston & Peter Galison echo this idea in a discussion of three different atlas images from the physical sciences; an 18th century botanical drawing, a 19th century image of a snowflake and a 20th century image of solar magnetograms:

Each is, in its way, a faithful representation of nature. But they are not facsimiles of nature, not even the photograph; they are nature perfected, excerpted, smoothed – in short, nature known. These images substitute for things, but they are already admixed with knowledge about those things (2007:53).

Daston and Galison elaborate on this concept in their book, *Objectivity*. They investigate atlas images throughout history but turn the eyepiece of the telescope around, so to speak, to focus on the role of the observer, the scientific process and the reader. They aim to show how scientific images reflect changing epistemic values and focus specifically on objectivity as an epistemic virtue. They define objectivity as follows: “To be objective is to aspire to knowledge that bears no trace of the knower – knowledge unmarked by prejudice or skill, fantasy or judgment, wishing or striving” (2007:17). The term “objectivity” has most often been paired with the discipline of science. However, objectivity has a history, which only started to surface as a significant way of thinking about scientific knowledge in the mid-19th century, termed “mechanical objectivity” by Daston and Galison²⁹ (2007:28,42).

29 The term “objectivity” changed significantly in meaning from antiquity to the mid-19th century and the contemporary timeframe. Originally, it meant the opposite of what we understand from the term today. Daston and Galison explain: “‘Objective’ referred to things as they are presented to consciousness whereas ‘subjective’ referred to things in themselves” (2007:29).

It developed as a reaction to the scientific value that preceded it, namely “truth-to-nature”³⁰. This type of image-making wasn’t aimed at producing exact replica of natural objects. Instead, physical scientists intervened and shaped their images to stand for a standardised form of a natural phenomenon. In contrast, “mechanical objectivity” aimed towards automatism. Choices of process and instrumentation were embedded in the aspiration for objectivity: mediation was kept to a minimum through methods such as tracing and basing representations on measurements, grids and structures. Photography, a new medium for this time, was often the preferred method of representation (Daston and Galison, 2007:43).

This change from “truth-to-nature” to “mechanical objectivity” started to take place more or less between 1830 and 1840 (Daston & Galison 2007:49), a period that correlates with Herschel’s scientific practice. The scientific values from this historical timeframe presented tensions between subjectivity and objectivity, but regardless of the differences between them, both still aimed at representing nature as faithfully as possible (2007:382). This contrasts with the scientific aims in the present timeframe. Towards the end of the 20th century, a shift took place from the scientific image as a representation of the natural environment to the scientific image as a process which alters the represented environment. This was largely due to the development of nanotechnology, by which matter is manipulated on an atomic scale. In this way the agency of the observer in science is especially significant as the image has now become a tool to be utilised. An example is the atomic force microscope, used to visually scan molecules in addition to modifying them (Daston & Galison, 2007:382-384). Bas van Fraassen, in his book *Scientific Representation: paradoxes of perspective*, considers the role of instruments such as the microscope and telescope, and discusses two metaphors that have been used for these instruments, namely a

30 Epistemic values such as “truth-to-nature” were only general tendencies and not followed by all scientists. Through an examination of Herschel’s methods, it seems that he did not follow this tendency. For example, in the Cape Herschel examined flora extensively and was specifically interested in mutations and variations between individual flowers from the same species and from different locations (Warner, 1996:176). This focus appears to be in contrast to “truth-to-nature”, which favoured generalisations.

“window on the invisible world” and an “engine of creation”. He argues that the latter is a better description of the role of scientific instruments in the contemporary timeframe. An image of an object viewed through an instrument like a microscope is different from the original object: the observer is seeing a new optical phenomenon. This perception can be compared to moving spots of light, a reflection or a shadow in that it cannot be classified as the actual object that casts the shadow or reflects the light. Instead, it is similar to an illusion (2008:96-103). This is true for older forms of optical technologies as well, for example, the camera lucida, which was used by Herschel for his terrestrial sketches. Larry Schaaf, in a discussion on Herschel and the camera lucida, notes: “Seeing the world in a camera lucida is a very private experience, for in reality there is no image projected on the paper. What the artist is seeing is known as a “virtual image” (1989:12). However “virtual” or illusionistic”, these images affect our relationship with the represented space. Van Fraassen notes: “Once a new phenomenon has been created it takes its place in nature – for we and our efforts are part of nature. Those new phenomena are themselves observable and become part of our world” (2008:96). According to this view, the representation of nature does not stop with the scientific image from an instrument. The image through a telescope or microscope is a new creation and therefore representable in itself. This suggests a chain of translations with representation upon representation.

Such an ongoing process of representation, for example, from an object to a microscopic image of the object, to a depiction of this image etcetera, is a significant process in contemporary scientific technology. Jorg Hubel, in *On the Credibility of World-Pictures*, makes the following observation:

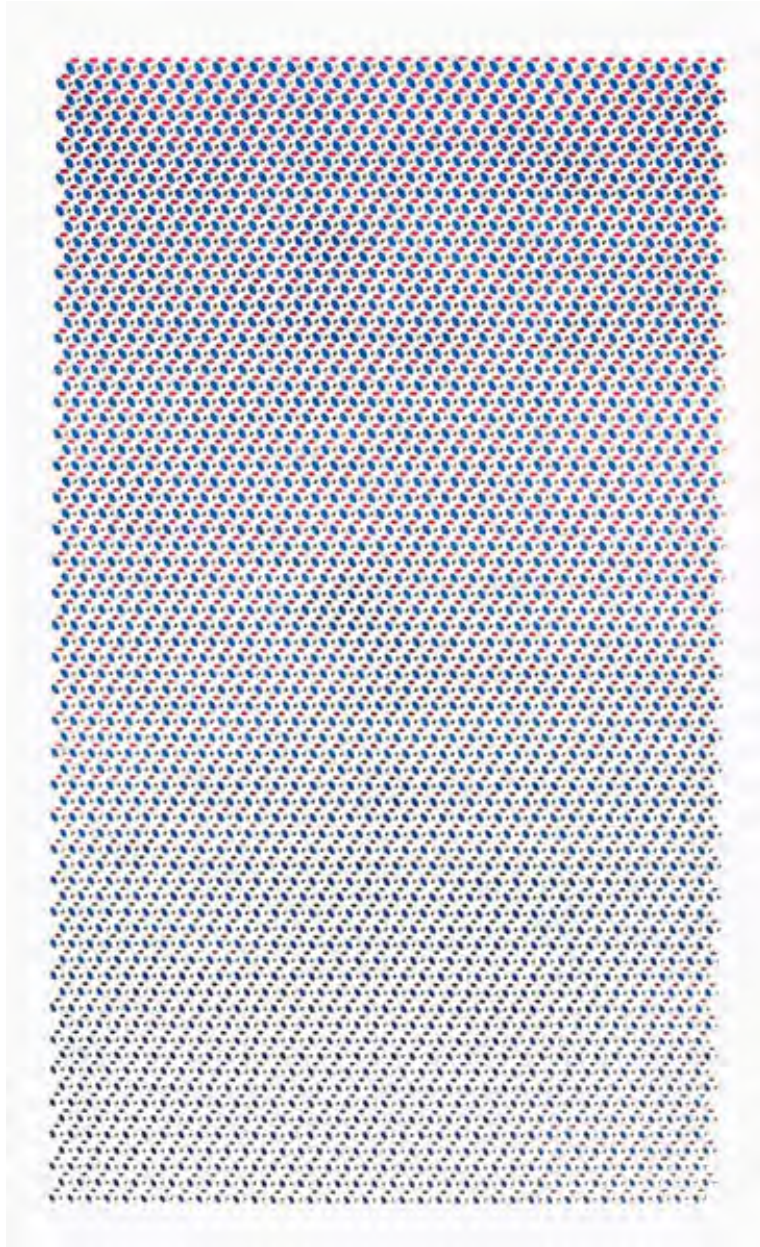
...the image does not refer (any more) to a world ‘behind’ or ‘under’ the image. It is not a probe that sounds the depths to bring to light something essential, fundamental – the truth. The vertical dimension is really a horizontal one. The image relates to other images; as a representation it refers to other forms and media of representation (2002:522).

Peter Galison expands on this exchange between representations and discusses the relationship between image and data in the sciences throughout history. He argues that in the 21st century new computer technologies have caused image and

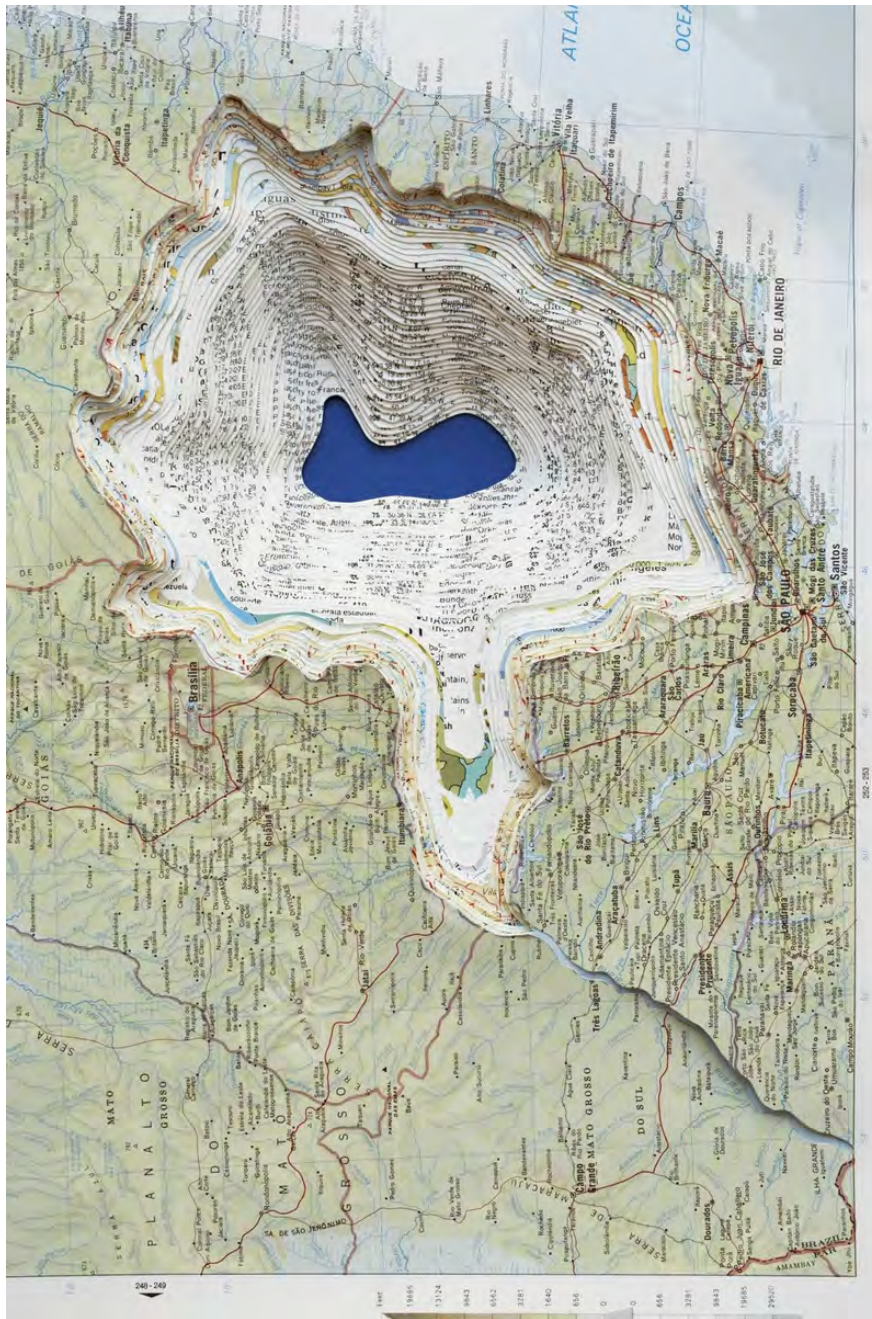
data to start to dissolve. Image and data now work within a string of translations back and forth, as Galison describes it: “Image to data to image to data to image to theory” (2002:316).

The work *Sieve* by South African artist Paul Edmunds resonates with this process. For this large-scale handcut paper screen print Edmunds took a digital photograph of a morning sky and mapped the changes in colours of the sky with Photoshop, according to the pixels’ values of cyan, magenta and yellow. He then translated this into a system of polygon shapes that present the different composition of colours. He transferred this information onto cyan, magenta, yellow and white sheets of paper, hung in front of each other, and cut out selected polygons so that the colours are seen in the correct relationships (Edmunds, 2008). Through this process a transient experience of light (where the composition will change in a wink) has been translated into a material, tactile representation. The sunrise has been translated from light to colour to shape and in accordance with the title Edmund has “sifted” the information in the photograph, thinning it out until it became a new object that takes on a life of its own.

This process of transforming information through a series of representations is similar to Maya Lin’s method for *Atlas Landscapes*, 2006. She produced this work by cutting relief landscapes into outdated world atlases. The removed forms suggest tide pools, mounds, craters and lakes (Harmon, 2009:253). Katherine Harmon notes in her discussion of this work: “An atlas is not a singular diagram of the land but a confident series of representations of data – flat, pictorial forms that break down a huge globe into smaller, manageable, and didactic segments” (2009:254). Lin disrupts this format by translating the two dimensional mapped environments into a three dimensional space. She undertakes a paradoxical process where she omits fragments of information that represent form in order to reveal actual form. The relationship between the represented environment and the scientific image starts to collapse.



PAUL EDMUNDS, *Sieve*, 2005.
A4 sheets of 200 gsm paper, silkscreen process colours, cold glue.
1880 mm x 1050 mm



MAYA LIN, *Atlas Landscapes*, 2006.



MAYA LIN, *Waterline*, 2006.

MAYA LIN, *Blue Lake Pass*, 2006.

The atlas now comes to stand for a new landscape, namely the negative space of the atlas (the imagined craters) and also a new, transformed representation: in *The Rand McNally New International Atlas*, 2006, the map represents a world where Germany and Asia are neighbours, only divided by Lin's canyon (Lebowitz, 2008:154). The viewer's encounter with these atlases has also been altered by the interventions: flipping through the atlases the viewer does not so much read the map as actively form the landscape by adding or taking away layers.

Viewer interaction is also prevalent in two large scale works by Lin, namely *Waterline* and *Blue Lake Pass*, 2006, through which the viewer can traverse. For *Water Line* Lin collected data from the sonar maps of a site on the Mid-Atlantic Ridge and selected an area of bedrock that rises from the sea floor and above sea level. She created a sculptural installation by suspending lengths of aluminium wire and creating a "line drawing" of the map (Harmon, 2009:251). *Blue Lake Pass* is based on the topology of a mountain range near her house in Southwest Colorado. The work consists of particle boards that have been vertically sandwiched together in blocks, presented in a four by five grid. The blocks are divided by corridors that allow the viewer to move through the work (Lebowitz, 2008:155). Both these works cite mapping technologies in the presence of a grid. But the grids become inversions of each other when the two works are viewed in relation. In *Blue Lake Pass* the grid is the negative space through which the viewer walks, while the landscape is solid matter. However, in *Water Line* the grid is presented as the solid material and the landscape reads as the negative space occupied by the viewer. Subjectivity is illuminated in these works, but the light is cast more on an awareness of the viewer's subjective stance than on that of the artist. In the case of *Blue Lake Pass* the viewer occupies the space of the grid, associated with the role of structuring the observed space. In *Waterline* the viewer occupies the space of the landscape, and in contrast to *Blue Lake Pass*, the viewer's body is now structured by the grid.

These countering spaces echo the paradoxical aims from "mechanical objectivity" where the self, as the root of scientific observation, could never be fully suppressed (Daston & Galison, 2007:374). Scientists tried to negate this by even leaving traces of scratches from lenses on the image or distortions in perspectives

from a photograph (Daston & Galison, 2007:45). Such marks, although attempts to minimise traces of the observer's persona, become traces of the observer's space, context and methodology; factors that point back to subjectivity. This is evident in *Sieve* through the artist's choice for representing a sunrise since viewing a sunrise is already a personal experience; it is particular to the specific context and time that the person is observing the scene.

The tension between objectivity and subjectivity has surfaced in my work through my working process and through the intended viewing experience. An example is the agency of the viewer in *Sound Sweep*. For this work the viewer can move the brass device to "survey" the image of the Lagoon Nebula. However, through this interaction the viewer is also creating something new, namely different variations of sounds. The name Lagoon Nebula, which refers to Herschel's image on which *Sound Sweep* is based, is significant in the reflective relationship that it sets up between this far-off nebula and our earthy environment. My working process parallels this reflection through a focus on the observer's position. For example, the data from the walk to Table Mountain for *Mensa: 12 Movements* is information that documents my standpoint and activities, and not, as conventionally recorded, information about the environment. Instead of examining the represented landscape from Herschel's drawing, my inversion was to search for the vantage point from which he drew the landscape.

Yet, although the work focuses on context, the methodologies that I used recall those of "mechanical objectivity". For example, *12 Steps to the Lagoon Nebula* is based on a specific scale measurement as well as a stencil which formed the image and acted as a type of grid. In the melodies for *Mensa: 12 Movements*, the role of the grid is suggested by the pinpoints on the GPS lines: it is set according to a specific tempo and a range of specific notes, which I had to follow carefully when performing the melodies on the French horn³¹. But regardless of these "objective" techniques, in each

31 This notion of pinpoints as a grid appears in Herschel's Cape observations and Brian Warner refers to Herschel's drawings of the mayor nebulae as "pointed observations": Herschel would first map the brightest stars, (for Eta Carinae he had to measure the position of 1216 stars) and then use this as a grid to fill in the detailed form and brightness of the nebula (Warner, 1992b:58).

work my role as maker and the influences by my location determined the outcome in some way. For example, the production of the shadow-based works was conducted by the weather since I could only work on cloudless days³². In *Eight Minutes Earlier: The Great Magellanic Cloud I* there is a small shift in the progression of the drawings, due to the wind which moved the paper slightly while I was working. *A Tree as Time as a Line as a Sound* echoes the shape of the long brass line (*A Tree as Time as a Line*) in the continuity of the long note that I played on the French horn. However, the sound is not as rigid and consistent as the visual line and this is a consequence of my own physicality since I played the note in one full breath. The note started to “wobble” as I started losing breath control.

While the methodology used for these works recall “mechanical objectivity”, which was prevalent in Herschel’s context, it also aims to echo the epistemic virtues of the contemporary context in which process is especially foregrounded. Similar to Galison’s concept of “image to data to image to data to image to theory”, the work takes the form of representations upon representations while the subject of these observations, Herschel’s images, are in themselves also representations of the natural environment³³. Since the work oscillates between past and present it makes references to scientific processes and instruments from both Herschel’s time and my own.

Sound Sweep and *Mensa: 12 Movements* carry elements of old and new technology. *Sound Sweep* is based on 19th century scientific instruments: the sextant and Cogniard de la Tour’s siren. The antiquity of these instruments is strengthened through the materials: mahogany and brass, most often used for 19th century scientific instruments³⁴. However, the use of laser-cut Perspex in the spinning disk

32 Due to the constraints by the weather on my production, my planning for each day would typically begin by going outside and inspecting whether the trees are casting clear shadows on the ground.

33 Herschel’s representations of the natural environment in his publication *Results of Astronomical Observations Made at the Cape of Good Hope* consider thought-provoking processes of translation. Hand-drawn directly from the eyepiece of the telescope, these drawings are intriguing as translations of a vast space to a flat surface, hazy shapes to a collection of fine dots and drawings created in reverse (black stars on a white surface).

34 This is based on observations I made from scientific instruments in the book *Nineteenth Century Scientific Instruments*, 1983, by Gerard L. E. Turner.

disrupts this reference to historical technology. The sound that results from this work makes further reference to contemporary technology due to its computer-like timbre. The works *Eight Minutes Earlier* and *A Tree as Time* reference the camera lucida as an instrument used outdoors, as well as the process involved in working with this instrument, namely tracing illusions of light. The processes of creating these works, with reference to Van Fraassen's theory on the microscopic image, result in images that become new creations, separate to its referents; the tree and the nebula drawings.

In *Time Trace* process and representation converge. The image is a depiction of the hourglass, the falling sand, and is reminiscent of a celestial body. At the same time this image was produced by the hourglass (which determined the form), the sand (which recorded the exposure time) and a celestial body (the sun, which developed the image). Since the creation of the image was dependent on the angle of the sun relative to the horizon the image is also a depiction of my own position in time and space. It contains a reflection of my presence similar to the reflection in the mirror of Herschel's telescope.



Soundwave image of the note I played on the French horn for
A Tree as Time as a Line as a Sound.

Time Trace, 2013 (process).



Time Trace, 2013 (process).

Minkowski's Footprint, a protoplanetary nebula in Cygnus.

IN BETWEEN THE GALLERY AND THE STUDY



25 January 2014, Cape Town

It is dusk and outside the gallery the mechanical sounds from “Sound Sweep” can faintly be heard, blending with a backdrop of faint stars and a view of Table Mountain in the distance. The sounds become clearer as I go inside: the plate from “Sound Sweep” is spinning and its dotted image of a nebula, hidden in a rotating blur of lines, is revealed in repetitions in the form of 12 etchings on an opposite wall. Each etched image of the nebula is slightly brighter than the preceding image and each has been created at a closer distance to the stencil matrix. But paradoxically, the brightest and closest image is a blurry shape, while the faintest and farthest image shows articulate pinpoints. These pinpoints repeat as variations on the connecting walls of the gallery: the dissipating pen dots in the three drawings from “Eight Minutes Earlier”, the luminous shapes surrounded by saturations of cyanotype blue in “Time Trace”, the ink-wash spots from “A Tree as Time”. These dots become a brass line, a sound, a measurement. On a nearby wall dots become data on a map, music notes on a score, the texture of a rock; each forming articulations of a specific position in time and space. These variations refer back to a central theme, presented as a book from 1847 at the entrance of the gallery.

7 March 1847, England

John Herschel leaves his study and, with the completed manuscript in hand, steps outside. He is on his way to Smith, Elder & Co to publish this book, which he titled “Results of Astronomical Observations Made during the Years 1834,5,6,7,8 at the Cape of Good Hope; Being a Completion of a Telescopic Survey of the Whole Surface of the Visible Heavens, Commenced in 1825”. The document includes drawings of nebulae, double stars, the Magellanic Clouds, sunspots, accounts of Halley’s comet from 1835 and studies on stellar brightness. But all these observations refer back to an image that Herschel included at the beginning of the document: a lithograph by George Henry Ford, created after a camera lucida sketch that Herschel drew in Cape Town. It shows his 20-foot reflector telescope in the orchard in Wynberg, with a view of Table Mountain in the distance³⁵.

³⁵ This account is based on factual information from Brian Warner’s *John Herschel 1792 to 1892: Bicentennial Symposium*, 1992 and *Flora Herscheliana: Sir John and Lady Herschel at the Cape 1834 to 1838*, 1996.



Image from the frontispiece of *Results of Astronomical Observations Made at the Cape of Good Hope*.

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CATALOGUE OF WORKS



Eight Minutes Earlier: The Great Magellanic Cloud II, 18 July 2012, 10:30 – 12:54.

Pen on paper.
400 mm X 400 mm



Eight Minutes Earlier: The Great Nebula of Orion, 27 May 2012, 14:00 – 17:00.
 Pen on paper.
 400 mm X 400 mm



Eight Minutes Earlier: The Great Magellanic Cloud I, 14 June 2012, 12:52 – 16:52.

Pen on paper.
400 mm X 400 mm



Sound Sweep, 2012.
Brass, Sapele mahogany, Perspex.
460 mm X 460 mm X 1040 mm



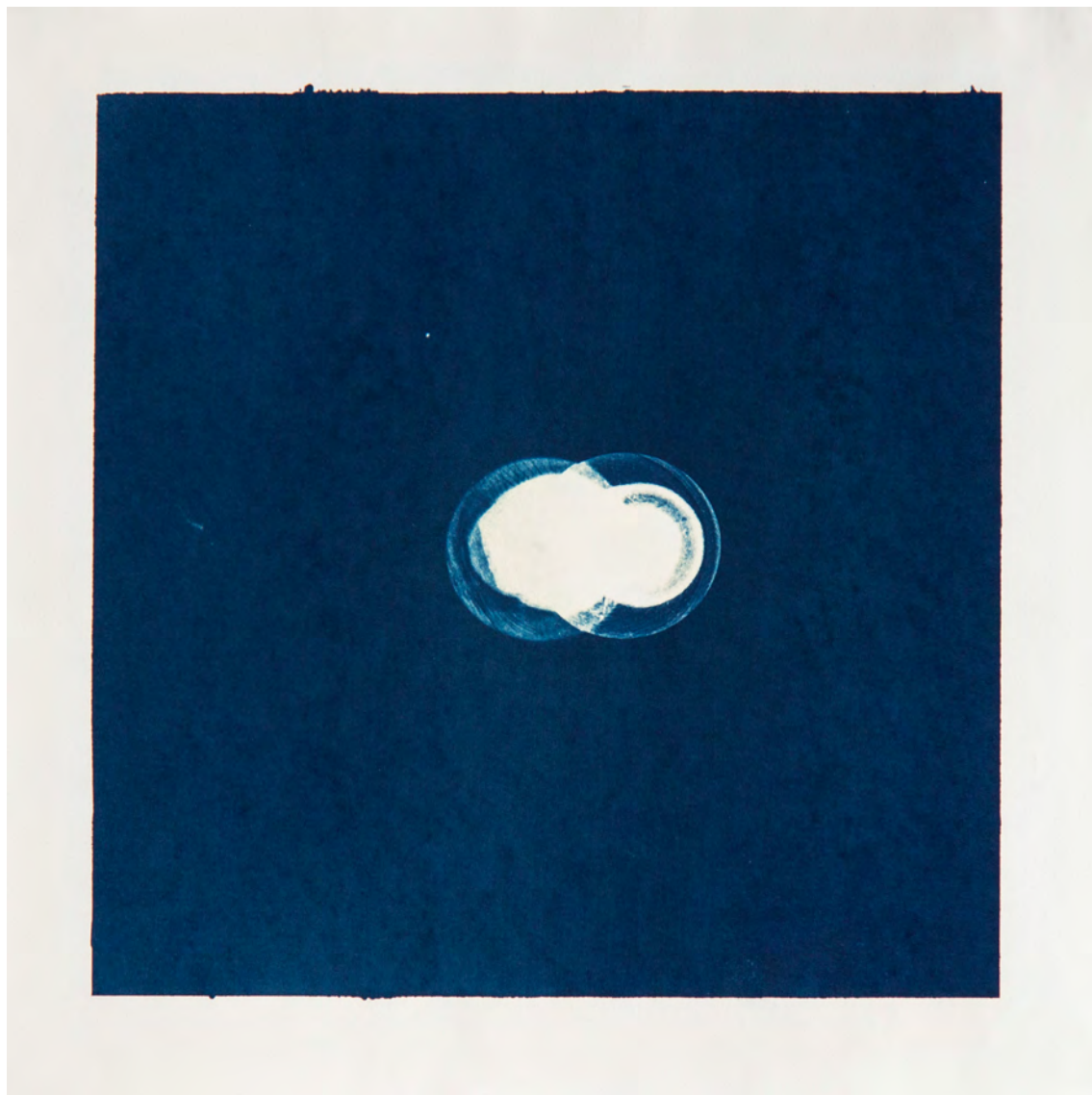
Sound Sweep, 2012 (detail).
Brass, Sapele mahogany, Perspex.
460 mm X 460 mm X 1040 mm



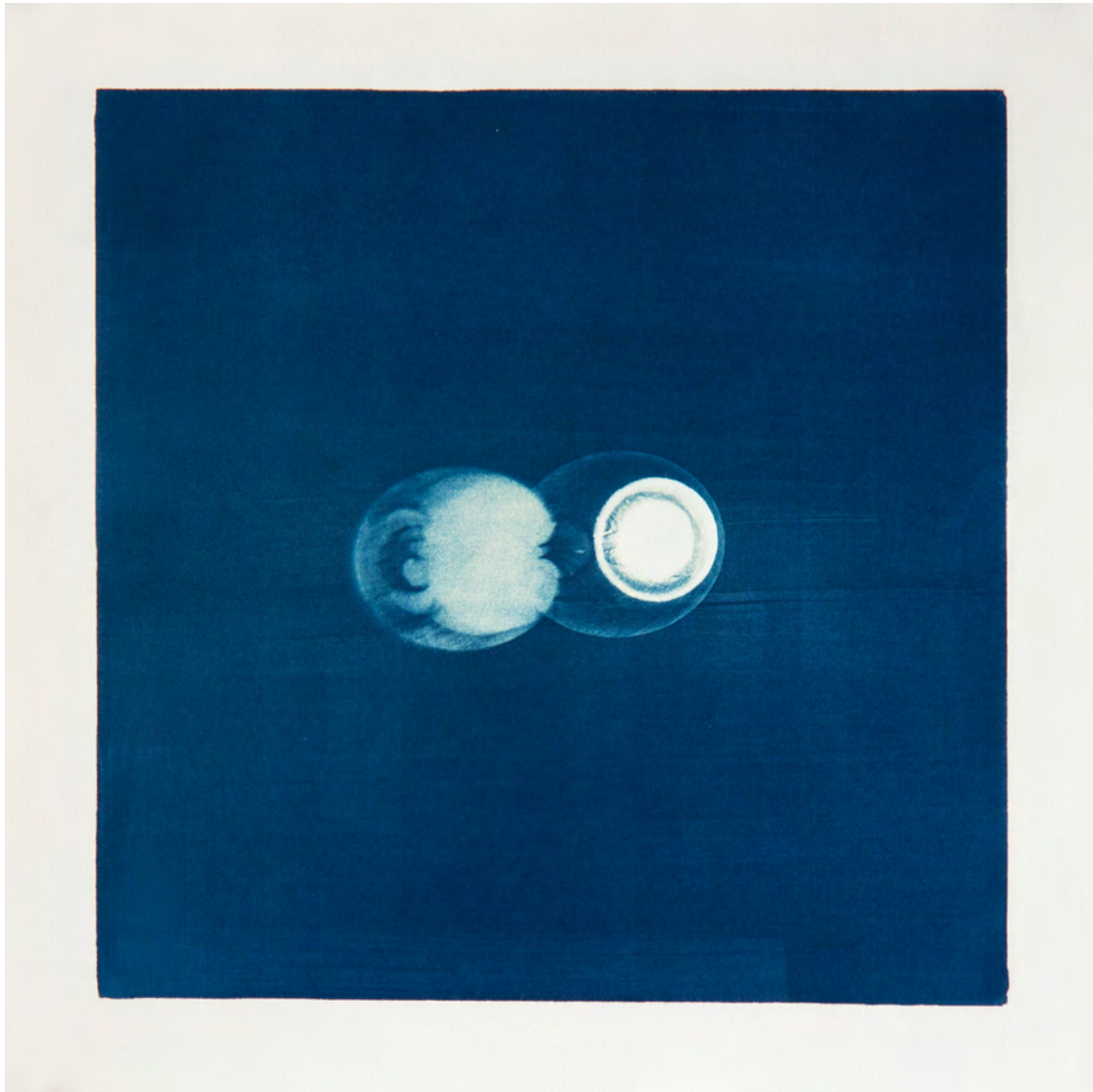
Sound Sweep, 2012.
 Brass, Sapele mahogany, Perspex.
 460 mm X 460 mm X 1040 mm



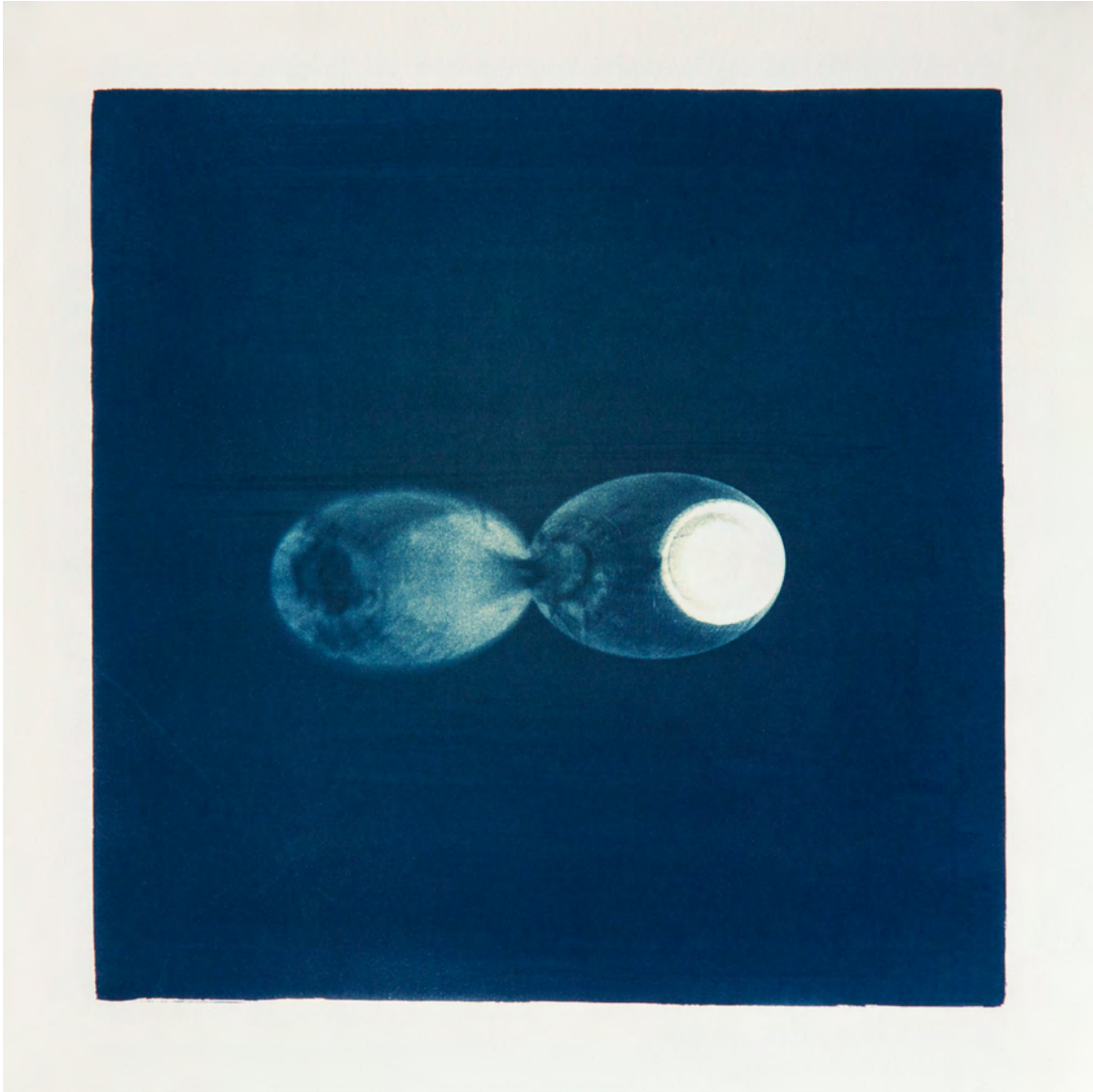
Paralipomenon II, 2013.
Brass, Perspex, magnifying glass.
170 mm X 170 mm X 90 mm



Time Trace: 2 November 2012, 12:00, 5 minutes.
Cyanotype on paper.
480 mm X 480 mm



Time Trace: 28 November 2013, 15:00, 8 minutes.
Cyanotype on paper.
480 mm X 480 mm



Time Trace: 8 May 2013 ,13:00, 12 minutes.
Cyanotype on paper.
480 mm X 480 mm



A Tree as Time, 2013 (detail).

Indian ink on paper.

1070 mm X 2995 mm



A Tree as Time, 2013.
Indian ink on paper.
1070 mm X 2995 mm

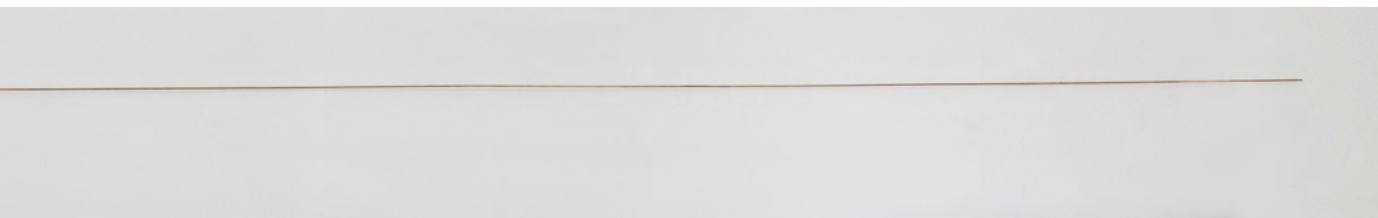


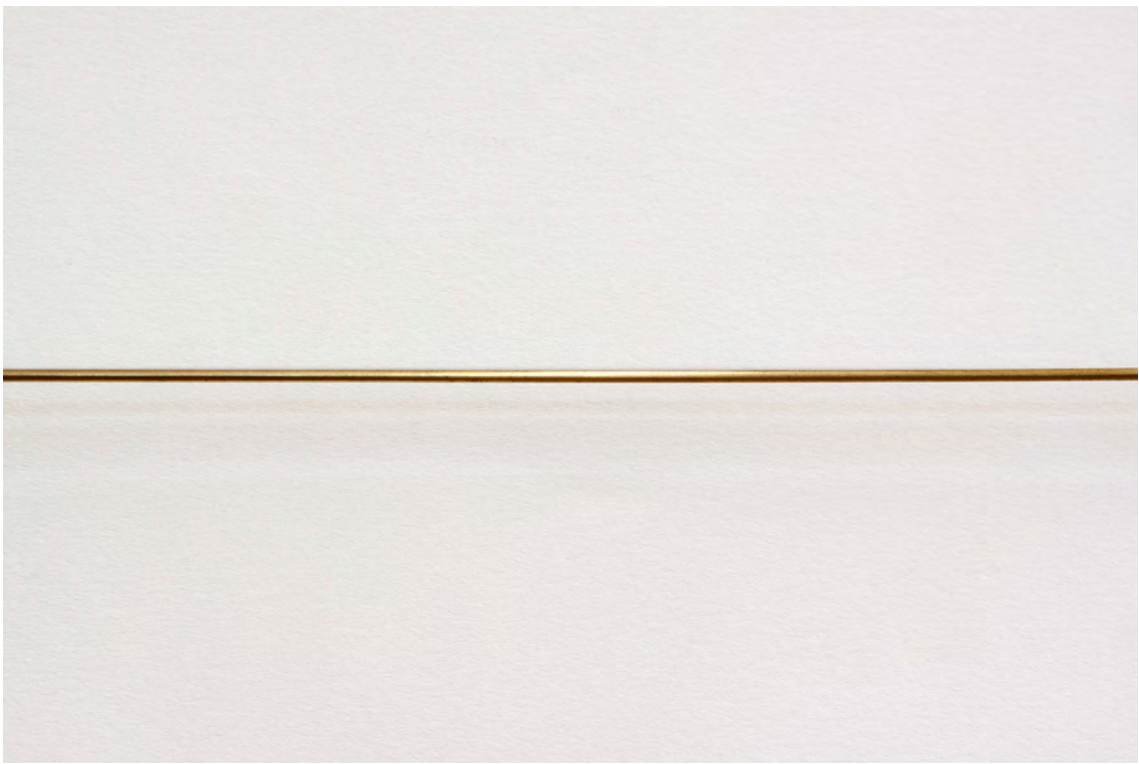


A Tree as Time as a Line, 2013.

Brass rodd.

2 mm X 3920 mm

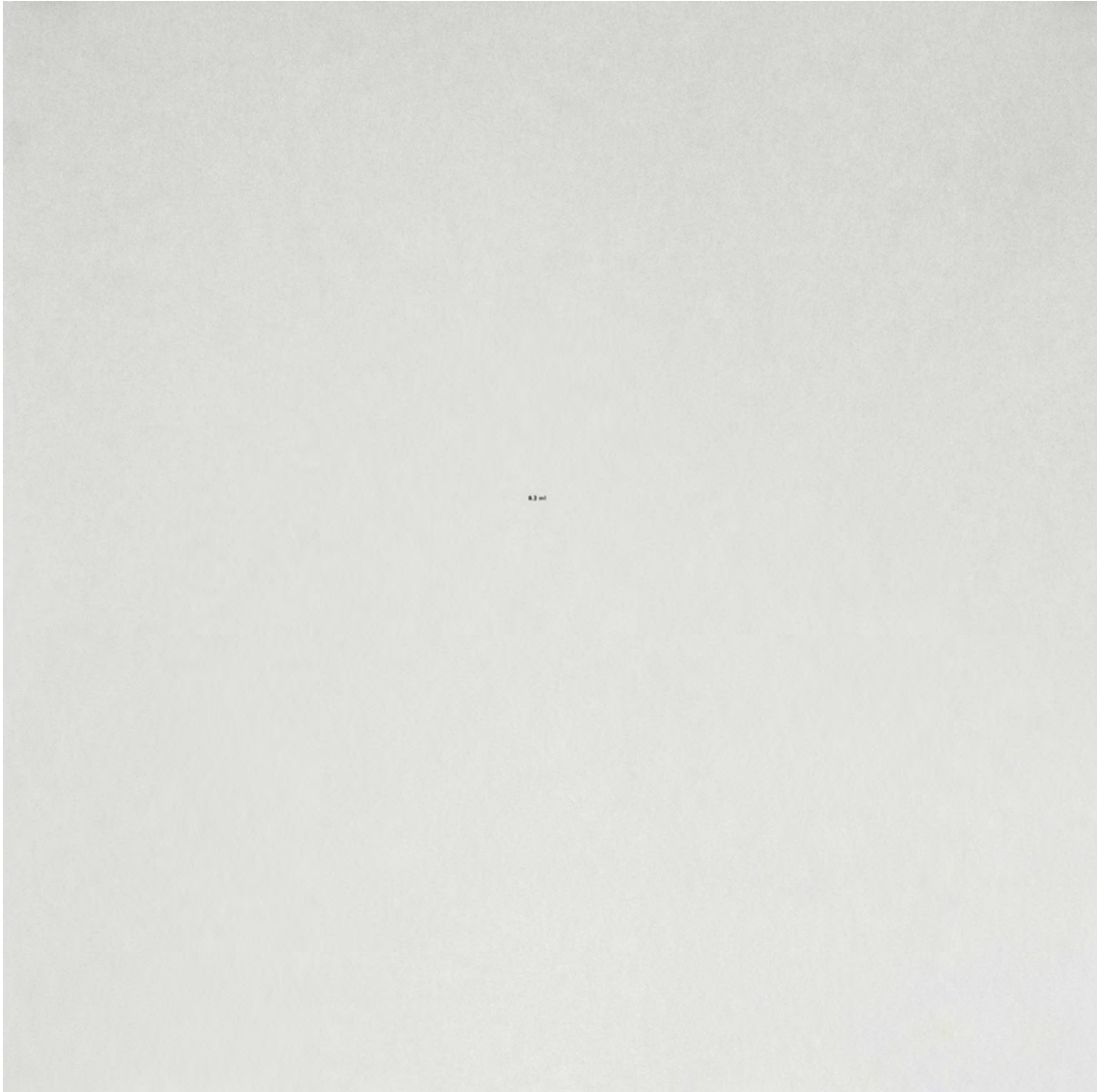




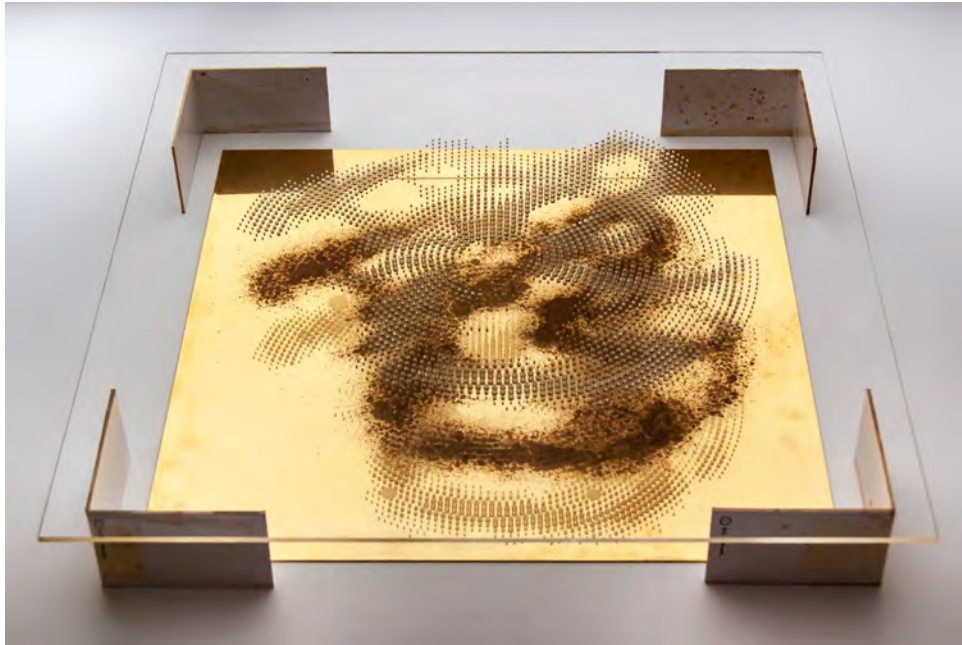
A Tree as Time as a Line, 2013 (detail).

Brass rodd.

2 mm X 3920 mm



A Tree as Time as a Line as a Sound as a Breath, 2013.
Letterpress print on paper.
480 mm X 480 mm



12 Steps to the Lagoon Nebula, 2013.
Brass, Perspex, Triplex. 420 mm X 420 mm X 50 mm



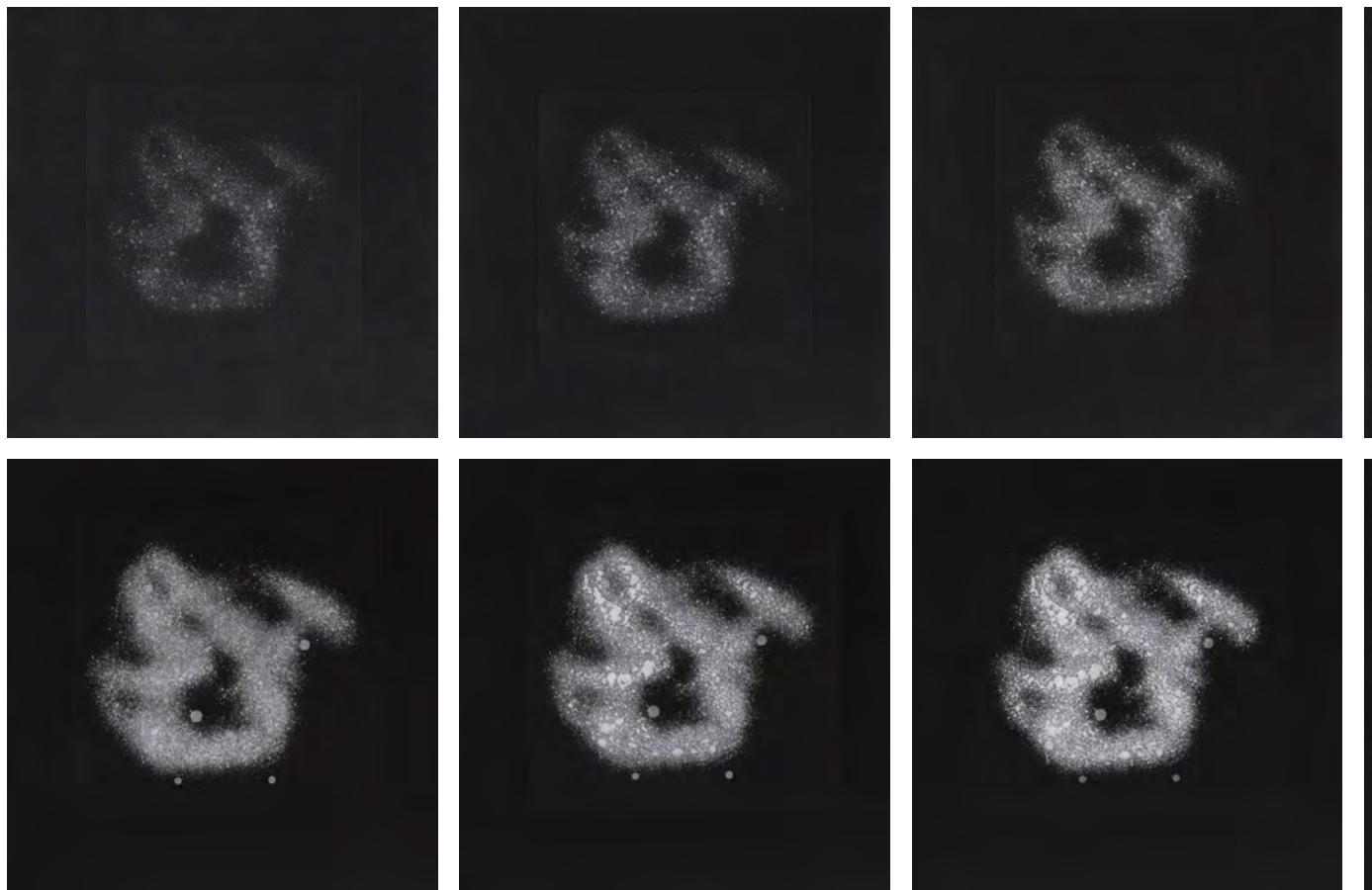
Paralipomenon I, 2013.
Triplex. 135 mm X 140 mm X 50 mm



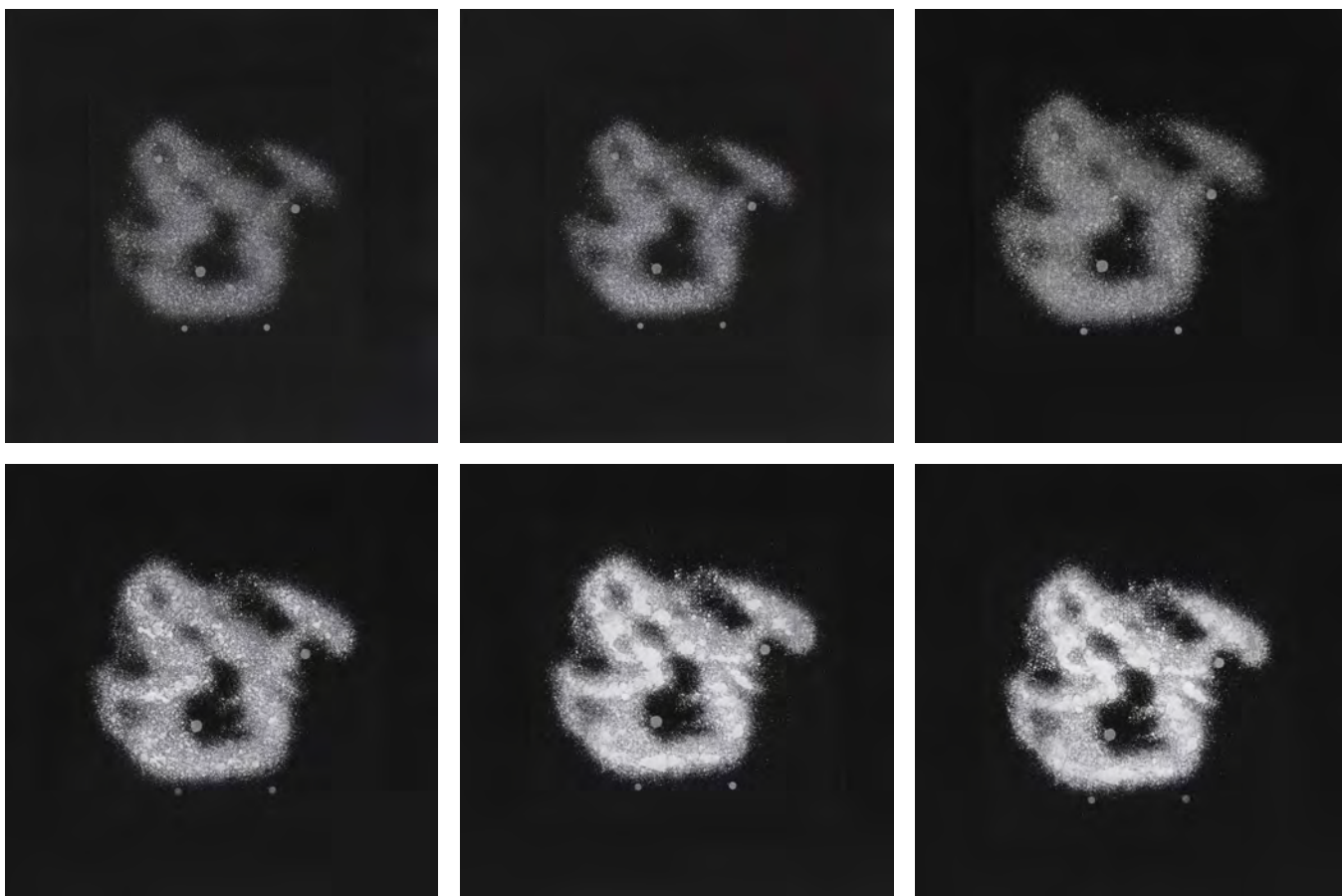
12 Steps to the Lagoon Nebula, 2013 (detail).

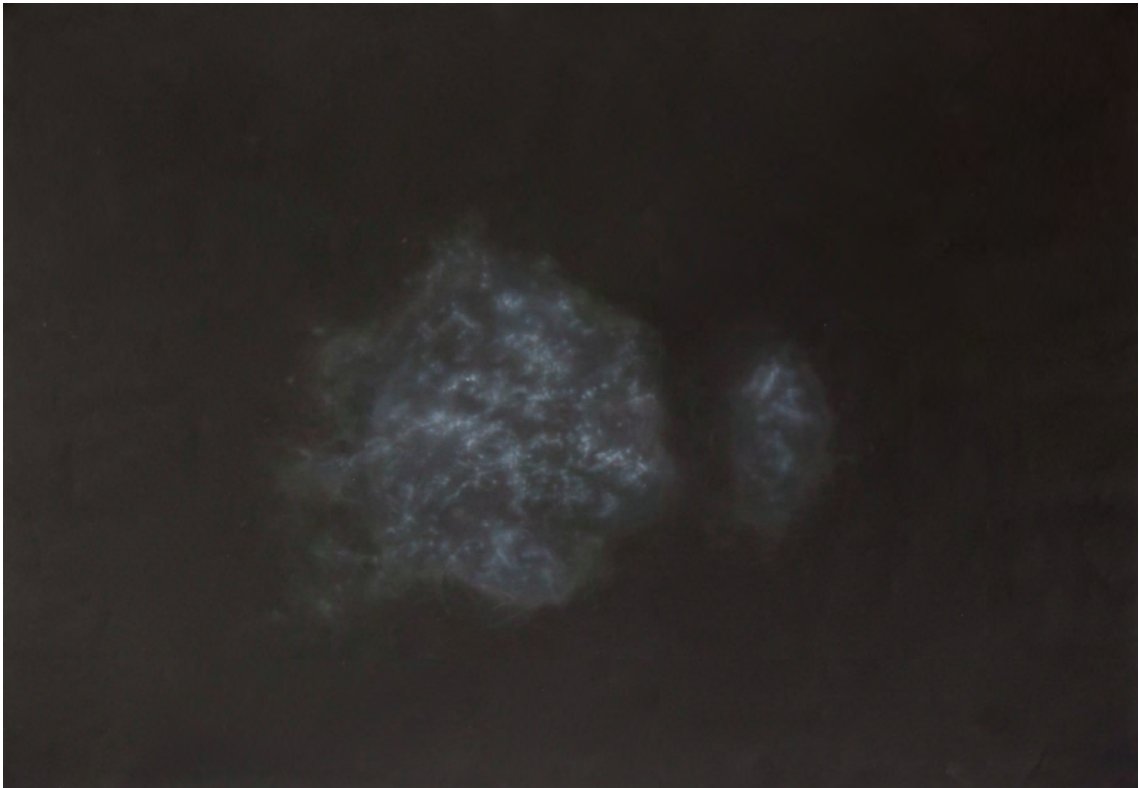
Brass, Perspex, Tripex.

420 mm X 420 mm X 50 mm

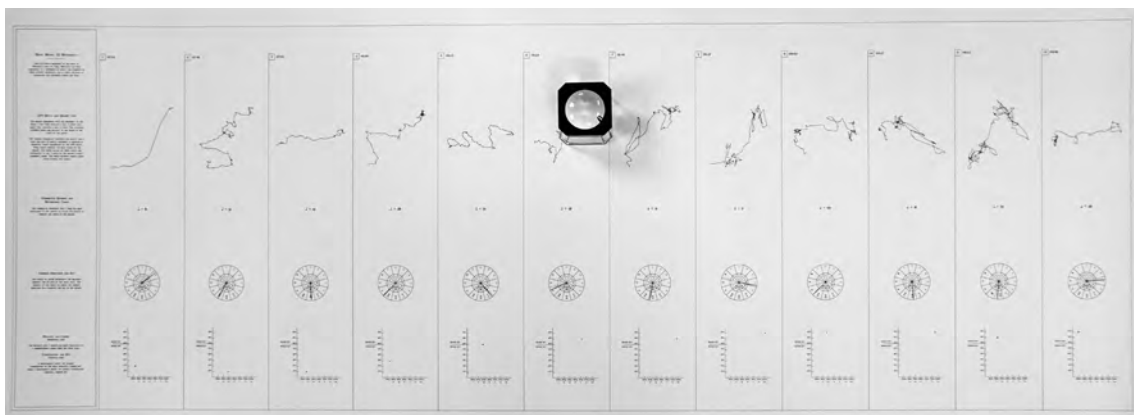


12 Steps to the Lagoon Nebula, 2013.
Etchings on paper.
560 mm X 560 mm





Mensa, 2013.
Soft pastel on paper.
700 mm X 1000mm.



Mensa: 12 Movements, 2013.
 Digital print and magnifying glass.
 574 mm X 1618 mm



Mensa: 12 Movements (notation of first movement), 2013.

Digital print.

210 mm X 270 mm

2 07:36

♩ - 51

a# III'

The image shows a page of musical notation for the second movement of 'Mensa: 12 Movements'. The page is numbered '2' in the top left corner, with a time signature of '07:36'. The notation is written on ten staves, each with a treble clef and a key signature of three sharps (F#, C#, G#). The first staff begins with a tempo marking '♩ - 51' and a dynamic marking 'a# III''. The notation consists of various note values, rests, and accidentals, with some notes marked with 'x' or 'o' symbols. The page is set against a light gray background.

Mensa: 12 Movements (notation of second movement), 2013.

Digital print.

210 mm X 270 mm

